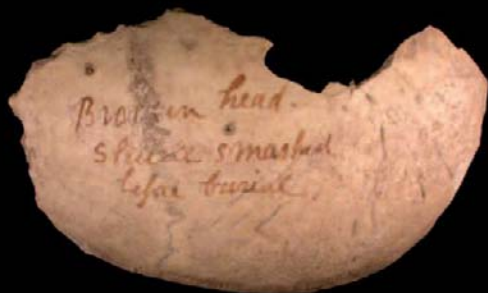


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STICKS, STONES, & BROKEN BONES

*Neolithic Violence in a
European Perspective*



Edited by RICK SCHULTING & LINDA FIBIGER

STICKS, STONES, AND BROKEN BONES:
NEOLITHIC VIOLENCE IN A EUROPEAN
PERSPECTIVE

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Sticks, Stones, and Broken Bones: Neolithic Violence in a European Perspective

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RICK SCHULTING AND LINDA FIBIGER

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Skeletal evidence for interpersonal violence in Neolithic Europe: an introduction

Rick J. Schulting and Linda Fibiger

John Thurnam, a nineteenth century medical doctor with a strong interest in prehistoric human remains, had little doubt that life in Neolithic Britain was on the whole ‘nasty, brutish and short’. Many of the broken skulls he examined from chambered tombs were described as intentionally cleft, and usually interpreted as sacrifices made on the death of a chieftain (Thurnam 1856, 1869, p.185). Even at the time, others disagreed with Thurnam’s diagnosis, attributing the breakages to post-depositional damage (Rolleston 1876, 1877, pp.684–690). The issue remained unresolved, and, for the most part, that is where the matter has stood until quite recently. Yet modern forensic approaches provide clear criteria for the identification of perimortem trauma (occurring at or near the time of death) (Berryman and Haun 1996; Lovell 1997; Sauer 1998), although archaeological material often presents unique challenges in terms of (in)completeness, and extensive post-depositional damage. The identification of healed cranial and facial trauma, on the other hand, is less affected by such considerations and relies more on close observation.

The focus in this volume is on evidence for interpersonal violence, as found on human skeletal remains. There are other lines of evidence for conflict (i.e. fortifications, settlement patterns, weaponry, and iconography) and an account dealing only with human remains cannot hope to provide a complete picture. Nevertheless, there are certain advantages to studying the effects of interpersonal violence on the skeleton, as they provide the most direct evidence of actual conflict leading to bodily harm. This is particularly the case for the

European Neolithic, for which formal weaponry is largely absent. Although sometimes embedded in human bone, arrowheads are usually interpreted as being primarily for hunting. Stone axes, although sometimes clearly used as weapons based on the shapes of cranial injuries, are usually interpreted as woodworking tools, or as status objects. The functions of the enclosures of the period are still debated, but for the most part, they do not seem to have been constructed with defence in mind, though there are some notable exceptions (Mercer 1981, 1988; Dixon 1988; Keeley and Cahen 1989; Koch 2001; Golitko and Keeley 2007; Mercer and Healy 2008). The study of human remains, then, provides an essential starting point, and has the potential to establish wider discussions concerning the extent and nature of interpersonal conflict in the Neolithic.

It has long been clear that the European Neolithic was not always peaceful, nor indeed were earlier periods. However, for the most part, examples of interpersonal violence have been limited to isolated cases, and, with a few notable exceptions, have not featured in the wider narratives of the period. Even the discovery in the early 1980s of the Early Neolithic mass grave at Talheim, southwest Germany, with evidence for the killing of 34 men, women, and children did not by itself dramatically change this picture (Wahl and König 1987; Wahl and Trautmann, this volume, Chapter 5). Although on a larger scale, this could still be seen as an isolated outbreak of violence: something clearly went wrong, but this was an exception to the normally peaceful interactions of Neolithic farmers, evidenced by their widespread exchange networks and by the apparent absence of formal weaponry in their material culture repertoire. Nevertheless, the pendulum continued to swing to the bellicose with the publication of Keeley's (1996) *War before Civilization*, in which both archaeological and ethnographic evidence worldwide was marshalled for the ubiquity of violence in small-scale societies past and present, and for its deadly intent and outcome. This was followed by a number of edited volumes taking as their subject, warfare and violence in prehistory (Carman 1997; Martin and Frayer 1997; Carman and Harding 1999; Parker Pearson and Thorpe 2005; Pollard and Banks 2007). To these may be added a number of important monographs, often with a regional focus, and many journal papers, too numerous to list. Violence was much more firmly on the agenda. Nevertheless, it is probably still fair to say that many European Neolithic researchers do not quite know how to integrate these accumulating cases into

accounts of Neolithic society (Hodder 1990; Whittle 1996). Are these still examples, albeit in increasing numbers, of exceptional circumstances in which things went wrong? How much of the violence occurred within a domestic setting, or between members of the same community, and how much occurred between different communities? To what extent are we seeing evidence for 'war', or can we explain most examples better as resulting from within-group conflict?

These are difficult questions, particularly so given the nature of much of the archaeological record. On the other hand, the European Neolithic record is in many ways a very rich and varied one, with a long history of research (Armit *et al.* 2007). A necessary first step is that we develop a much better understanding of just how much skeletal evidence for violence there is: the nature of the injuries (whether healed or unhealed, their location on the body, types of weapons implicated, etc.); the age and sex of those affected; and their mortuary treatment. Some of this information is becoming available but it is often on a site-specific or, at best, regional basis. There are also problems with literature-based reviews: publications reporting, or not reporting, evidence for violent trauma varied enormously in quality and detail. Many date to the early decades of the twentieth century (and some earlier than this), before the mechanics of bone fracture were well understood. Even more importantly, many of the available reports on human bone were written with other priorities, principally to provide basic demographic information; in many earlier reports, the study of population affiliation and origins took precedence even over this. Palaeopathology formed a strong secondary interest, but usually this focused on nutritional and developmental conditions, and on the kinds of wear and tear associated with ageing and with activity levels. The human skeleton is such a rich source of information that it is almost impossible to make all observations and measurements, even more so when large assemblages are being analysed. Thus, regardless of the qualifications and experience of the analyst (although these are also relevant) decisions are made as to what to systematically record. Few would miss a complete projectile point embedded in bone, but small fragments are another matter, particularly when found in elements such as ribs, which may be given only a cursory examination. Two recent examples from Britain are Penywyr-lod and Wayland's Smithy, with fragments of flint points found embedded in a rib fragment and in a pelvic fragment, respectively,

decades after the initial examination and publication of the assemblages (Wysocki and Whittle 2000; Whittle *et al.* 2007).

To move beyond the comparatively few well-known cases of interpersonal violence, and to place these into a broader perspective, a wider comparative approach is essential. This is, however, not a straightforward endeavour, and hampered by the vagaries of preservation and recovery. In the nineteenth century, the emphasis was primarily on collecting skulls to characterize different populations so that postcranial remains were often not retained. The collective burials that feature for much—though not all—of the western European Neolithic present other difficulties, in terms of matching the crania and postcrania of the same individuals, and the high degree of fragmentation that results from repeated insertions (Beckett and Robb 2006). Furthermore, with the exception of embedded projectile points, and perhaps parry fractures, most postcranial injuries are usually more readily attributable to accidents rather than to interpersonal conflict (Lovell 1997; Neves *et al.* 1999). For these reasons, the primary focus in many papers in this volume is on cranial trauma. The advantage of this is that it facilitates comparisons between the regions. The obvious disadvantage is that it considers only part of the potential evidence for violence.

Another problem with a comparative approach is that chronology, marking out the tempo of social and cultural developments, differs across Europe. How are we to compare like with like? An appraisal of the evidence for violence in areas dating to the same centuries in many cases is clearly going to offer only limited insights: a clear example illustrating this point would be a comparison between central Europe and either Britain or southern Scandinavia at ca. 5500 cal bc. In central Europe, this period sees the widespread appearance of the first Neolithic culture in the region, the Linearbandkeramik (LBK, or Linear Pottery Culture), while the same period in Britain and southern Scandinavia was firmly within a Late Mesolithic, hunter-gatherer context. Related issues arise in the use of terminology, specifically the term 'Neolithic', which in eastern Europe denotes the first appearance of pottery rather than any marked change in the subsistence economy, as in western Europe.

The chapters in this volume provide overviews of different regions of predominantly western Europe, ranging in scale from a focus on single sites (Chapter 5, Wahl and Trautmann; Chapter 6, Teschler-Nicola; Chapter 7, Orschiedt and Haidle; Chapter 15, Vegas *et al.*) to

well-defined localities (Chapter 2, Ahlström and Molnar; Chapter 8, Lidke; Chapter 9, Wicke *et al.*; Chapter 10, Fibiger; Chapter 16, Oosterbeek and Tomé), to entire countries (Chapter 3, Jankauskas; Chapter 11, Smits; Chapter 12, Beyneix; Chapter 13, Schulting; Chapter 14, Papathanasiou; Chapter 17, Silva *et al.*). There is a concern in many of the chapters with placing observed cases of violence within a population perspective (i.e. with documenting how many individuals do *not* show evidence of trauma, alongside details of those that do). While not all of Europe is represented (Table 1.1), the scope of the volume is nevertheless considerable, and combined with a strong chronological focus on the Neolithic, it provides an excellent starting point for further studies of the extent and nature of interpersonal violence.

Ahlström and Molnar (Chapter 2) report their findings for 109 adult crania from the Pitted Ware Culture (ca. 3500–2300 cal BC) of Gotland in the central Baltic Sea, with evidence for trauma in 14% of the males and 7.7% of the females analysed. Strikingly, with the exception of one female cranium, all show healing. The Pitted Ware Culture is of particular interest, in that, although nominally ‘Neolithic’, the subsistence economy focused very much on marine mammals, while surrounding Trichterbecher Culture groups in the same general area practised mixed farming. Stable isotope data demonstrate that these were two distinct populations, and not specialized aspects of a single adaptation (Eriksson 2004). These data will provide the opportunity to compare populations living at the same time, in the same region, but with very different economies. While there is no necessary connection between the mode of production and prevalence of interpersonal violence, this is certainly an avenue worth exploring in particular contexts. The dominance of healed cranial injuries recalls a similar pattern seen in the Danish Mesolithic (Bennike 1985).

Jankauskas (Chapter 3) presents an overview of his examination of nearly 250 Mesolithic and Neolithic skeletons from Lithuania and Latvia, with the majority deriving from the important multi-period site of Zvejnieki. As Jankauskas notes, the term ‘Neolithic’ in the eastern Baltic refers to the presence of pottery, with the economy still very much based on fishing, hunting, and gathering, akin to that of the Late Mesolithic Ertebølle culture of southern Scandinavia. Unlike the Danish case (Bennike 1985), however, Jankauskas found very few injuries, though five males with what are described as ‘circumscribed inflammatory lesions’ on their skull vaults may relate

Table 1.1. Regions and periods covered in the volume

Region	Period/cultural horizon	Date cal BC	Author
Southern Sweden	Pitted Ware	3700–2300	Ahlström and Molnar
Lithuania and Latvia	Middle Neolithic–Early Bronze Age	5900–1400	Jankauskas
Poland	Lengyel	4700–4000	Lorkiewicz
Northwest Germany	Wartberg	3500–2800	Fibiger
Northern Germany	Single Grave	2800–2200	Lidke
Central Germany	Corded Ware	2700–2000	Wicke <i>et al.</i>
Southern Germany	Linearbandkeramik	5300–4900	Orschiedt and Haidle
Southern Germany	Linearbandkeramik	5300–4900	Wahl and Trautmann
Austria	Linearbandkeramik	5300–4900	Teschler-Nicola
Netherlands	Late Mesolithic–Middle Neolithic	5500–3500	Smits
France/Western Europe	Early–Late Neolithic	6th–3rd millennium	Beyneix
Britain	Earlier Neolithic	4000–3200	Schulting
Greece	Mesolithic–Neolithic	8200–3200	Papathanasiou
Northern Spain	Chalcolithic	ca. 3000	Vegas <i>et al.</i>
Portugal	Middle–Late Neolithic	4000–2500	Silva <i>et al.</i>
Central Portugal	Neolithic–Chalcolithic	6th–3rd millennium	Oosterbeek and Tomé

to trauma, as may one example of a trepanation. Clear examples of violent death are not seen until the Late Bronze Age, by which time the economy was agricultural.

Lorkiewicz (Chapter 4) presents the results of his study of 109 Early Neolithic skeletons of the Brześć Kujawski group in central Poland, a regional manifestation of the widespread Lengyel culture of the fifth millennium BC. Nineteen lesions attributable to interpersonal violence were recorded on 14 individuals, over half of which were males. All five settlements from which the analysed assemblages derived exhibit signs of partial destruction and fires, with the construction of a ditch and palisade fortification following this event at one site (i.e. Osłonki). This begins to suggest a wider context for the observed skeletal injuries, and, if the two lines of evidence can be connected, would argue for between-group conflict rather than internal disputes.

Chapters 5–7 report on pivotal Early Neolithic sites in central Europe: Talheim, Asparn-Schletz, and Herxheim. All three have significance far beyond their local contexts, and have been central to discussions of interpersonal violence in the Neolithic. Their apparent near-contemporaneity in the Late LBK, ca. 5000 cal BC, has raised the possibility of a cultural collapse of some kind, argued by some to relate to deteriorating climatic conditions, though there are issues of chronological resolution (Gronenborn 2007; see also Orschiedt and Haidle, Chapter 7).

Wahl and Trautmann (Chapter 5) revisit the paradigm-shifting Early Neolithic mass grave at Talheim, southwest Germany, dating to ca. 5000 cal BC. Their discussion focuses on the sequence of events that led to massacre of a whole community as well as morphological and isotopic evidence that has helped to decipher kinship structures within this group of 34 men, women, and children. The nature of burial and demographic profile of the Talheim mass grave suggests to the authors that aggressors came not simply to plunder and pillage but to replace the local community and take over their resources. Often mentioned in the same discussions as Talheim is the Late LBK enclosure at Asparn-Schletz in Austria. Teschler-Nicola (Chapter 6) provides a summary of the large human bone assemblage from the enclosure ditches, which reveal numerous lethal injuries suggesting that the site suffered a large-scale attack (Teschler-Nicola *et al.* 1996; Windl 2001). Most intriguing is the dearth of young adult women in an otherwise catastrophic profile, with subadult and adults in proportions similar to those expected in a living population. This

has been interpreted as the taking of young women as captives, a practice well attested in the ethnographic literature of small-scale societies (cf. Otterbein 2000). Orschiedt and Haidle (Chapter 7) present their research on the controversial Late LBK enclosure at Herxheim in southwest Germany. Early interpretations of the human bone assemblage from the site emphasized the presence of violent injuries to the many crania recovered in the enclosure ditches (Häuszer 1998). This interpretation was subsequently modified, with the fractures being seen as post-mortem modifications undertaken as part of a secondary mortuary ritual (Häußer *et al.* 2006). Debate over the site has recently been rekindled by the suggestion that at least part of the assemblage provides evidence for cannibalism (Boulestin *et al.* 2009). Here, Orschiedt and Haidle reiterate their position that violence was primarily being enacted on the dead rather than on the living, at the same time questioning evidence for a 'crisis' in the Late LBK.

Moving into the later Neolithic period, Lidke (Chapter 8) provides a discussion on Single Grave Culture (2800–2000 cal BC) burials from northern Germany, focusing on trepanation and healed trauma. Her study emphasizes that single graves were not necessarily the most important burial rite for this group. A programme of radiocarbon dating has placed a number of injured individuals from megalithic graves in Mecklenburg-Vorpommern, Schleswig-Holstein, and Lower Saxony, not in the Middle Neolithic as expected but within the Late Neolithic Single Grave horizon. Virtually all individuals from this period with signs of trepanation are males and Lidke proposes a context of male-dominated, mostly non-lethal violent interaction for the observed pattern.

Staying with Late Neolithic Germany, Wicke *et al.* (Chapter 9) present the results of their contextual analysis of cranial trauma in the Corded Ware Culture (2700–2000 cal BC) of central Germany. Like Lidke (Chapter 8), their study shows that individuals exhibiting cranial injuries are predominantly males, often older adults. In addition, these individuals tend to be more frequently buried with stone objects, especially battle axes. These martial grave goods, according to Wicke *et al.* illustrate that 'those who lived by the axe, carried a greater risk to be wounded or to perish by the axe'. Fibiger (Chapter 10) gives an overview of violence-related cranial trauma in the Late Neolithic German Wartberg Culture (3500–2800 cal BC), noting endemic levels of violence that—unlike the Single Grave/Corded

Ware injuries presented by Lidke (Chapter 8) and Wicke *et al.* (Chapter 9)—affected men, women, and children. This pattern suggests different scales and contexts for violent interaction during the period, ranging from fights between individuals to more extensive raiding or even organized battles. The role of women and children in these events appears to have been one of victim rather than aggressor, judging from the distribution of injuries on the cranium.

Sites in the Netherlands suffer from relatively poor bone preservation, but a number of assemblages are available, spanning the Late Mesolithic to Middle Neolithic. Smits presents an overview of this material, comprising 34 individuals in total. Clear evidence for traumatic injury is limited to only two individuals, but it is particularly interesting that they appear to show a different burial treatment. One is from a double inhumation, raising the question of the interpretation of skeletons without evidence of trauma found directly associated with those that do exhibit peri-mortem injuries. While dating to the Early/Middle Bronze Age, the mass grave at Wassenaar provides a clearer example of a ‘war grave’ containing 12 men, women, and children. While only the males exhibit injuries, it is reasonable to interpret all of the deceased here as victims of an attack. Smits’ contribution (Chapter 11) is of additional interest in her use of stable isotopes to investigate whether those exhibiting injuries are local to the area, or are outsiders. Clearly, this is an important area of research in terms of understanding the context of violence, one that has only begun to be explored (e.g., Price *et al.* 2006).

Beyneix (Chapter 12) provides an overview of published evidence for violence from France, focusing primarily on arrow injuries, as there has yet to be a systematic examination of the cranial material. While an early example is known from the Mesolithic site of Tévéc in Brittany, most evidence comes from the Final Neolithic/Chalcolithic of southern France, where large skeletal assemblages are available from a series of dolmens and caves, the latter both natural and artificial. The cave of Les Baumes Chaudes, Lozère, stands out in holding some 300 individuals, a number of which show embedded arrowheads, though the site is better known for the large number of trepanations present (Prunières 1878). Another key site is Roaix, Vaucluse, and specifically its so-called ‘war level’, with 60–70 men, women, and children packed closely together, often head to foot. Some seven arrowheads were found directly embedded in bone, while many others were found scattered through the deposit, and

may have originally been embedded in soft tissue. The assumption is that this represents a single depositional episode. A number of healing projectile injuries are noted from various sites, mainly in the limb bones, which might suggest conflict at some distance; first, because the individual was able to withdraw from the scene and survive, and secondly because the limbs would probably not be the target of choice for antagonists at close range. While noting considerable evidence for violence in the Neolithic, both in France and elsewhere in Europe, Beyneix argues that the beginnings of war proper are to be found only in the Bronze Age with the appearance of weaponry and emergence of a military caste. Whether this is accepted or not depends on one's definition of war, but it is unarguably the case that the Middle Bronze Age sees the first formal weaponry, in the form of the sword, whose sole purpose is the killing of other human beings (or the ostentatious display of the capacity to do so).

Schulting (Chapter 13) raises the possibility of regional variation in the prevalence of cranial injuries between southern and northern Britain within the earlier Neolithic (ca. 4000–3200 cal BC), and of contextual variation, between those interred within collective mortuary monuments, and those found in other, non-monumental contexts. The difficulties in both comparisons are considerable, due in part to differential preservation, but also to varying mortuary practices. The need to date individuals more systematically and directly from caves in particular is highlighted, to address the possibility that remains found in mortuary monuments are not representative of the overall population. However, preliminary results suggest that comparable numbers of Neolithic individuals from caves also show injuries.

Papathanasiou (Chapter 14) presents an overview of the Greek Neolithic, which, at ca. 6700 cal BC, commences far earlier than any other region discussed in this volume. She begins even earlier, with a small but important Mesolithic assemblage from Franchthi Cave. While the numbers are not large, it is interesting to note that cranial trauma is more prevalent in the Mesolithic sample (two of 17 crania) than in the Late Neolithic assemblage from the same site (none of 46). This recalls a similar trend observed by Bennike (1985) for the Danish Mesolithic/Neolithic, though with higher prevalence rates for both periods. While a comparison of Early and Late Neolithic assemblages hints at an increased prevalence of cranial trauma over time, the difference is not statistically significant. Once again, the majority of

injuries in the Neolithic show healing, leading Papathanasiou to conclude that the evidence reflects sporadic, non-lethal, face-to-face confrontations between mainly young adult males, though injuries are not entirely absent on women and children. The difficulty of interpreting postcranial fractures as evidence for violent encounters is also discussed. Even greater interpretative difficulties are encountered in a multiple burial of eight individuals at Alepotrypa Cave. They exhibit no trauma, but one is in an unusual position, lying face down, while some of the others have disarticulated limbs. Cases such as this are not infrequent in European prehistory (nor, indeed, are they elsewhere) and their interpretation presents a considerable challenge.

Vegas *et al.* (Chapter 15) present their findings from the important Late Neolithic/Chalcolithic (ca. 3000 cal BC) site of San Juan ante Portam Latinam in northern Spain. The focus on a single site here is more than justified by the large number of individuals represented: a minimum of 338 men, women, and children. As in a number of chapters in this book, the question of contemporaneity arises, and, while it cannot be fully answered, deposition here does appear to have taken place over a relatively restricted period. At least 11 individuals exhibit arrow injuries, some showing signs of healing and others clearly peri-mortem, while a number of crania exhibit healed depressed fractures. What is perhaps most striking is the possibility that many of the other arrowheads—often damaged—found intermingled with the human remains also represent the cause of death rather than grave offerings, which would significantly increase the number of individuals dying violently. Vegas *et al.* also draw attention to other contemporary sites in the region, including nearby Longar with four projectile points embedded in bone, and the burial cave at Costa de can Martorell with some 200 individuals present. While no embedded projectile points were found at this site, an analysis of impact fractures on broken points found scattered among the remains suggests that violence may have featured here as well, calling into question the more usual interpretation of such finds elsewhere as grave offerings.

The next two chapters in the volume present evidence for violence-related trauma from Portugal. Oosterbeek and Tomé (Chapter 16) present their findings from three collective burial caves in central Portugal, with material spanning most of the Neolithic period, from ca. 5000 to 3000 cal BC. Sixty individuals are represented, but not all

are complete and preservation is often poor. Nevertheless, seven cases of cranial trauma are reported, all showing signs of healing. All are on adults, and, where sex can be determined, all are male. There is no side preference to the location of the injuries. Silva *et al.* (Chapter 17) provide an overview of Late Neolithic skeletal collections, noting evidence for 43 traumatic lesions, of which the great majority are healed cranial depressions. One of these is a trepanation apparently associated with an injury, recalling the argument that at least in some cases this procedure was carried out in order to treat head wounds (Bennike 1985; Weber and Wahl 2006; Petrasch 2008). Postcrania are also considered, and provide one case of an embedded arrowhead, which is fairly unambiguous evidence for interpersonal violence, and five cases of cut marks. The latter feature in a number of chapters in the volume, and are subject to various interpretations: none are unambiguously linked to violence, as opposed to ritual defleshing and dismemberment.

A number of more general themes and interpretative issues run through the contributions here. First, is the difficulty of finding intent in the observed injuries. Thus, many of the chapters—Talheim, Asparn/Schletz, and San Juan ante Portam Latinam being clear exceptions—stop short of offering a definitive context for the injuries discussed, whether the result of warfare, feuding, domestic violence, etc. This is not surprising, as difficulties of distinguishing these possibilities are well known, though in some cases patterning in the injuries, together with other lines of evidence, can begin to suggest which alternatives may be more likely. Wicke *et al.*'s chapter is particularly interesting in this regard, with those individuals exhibiting injuries more likely to be interred with stone battle axes.

Dating is another topic that needs to be addressed in detail. While the mass graves at Talheim and (Bronze Age) Wassenaar appear to be simultaneous deposits, the same cannot be said with certainty for San Juan ante Portam Latinam, Roaix, the Portuguese collective burial caves, and others. The length of time over which these assemblages accumulated clearly impacts how they are to be interpreted. The potential of Bayesian modelling to provide more accurate and precise chronologies for British Neolithic mortuary monuments has recently been highlighted by Bayliss and Whittle (2007), and the wider application of this methodology has much to offer. At the level of individual burials, Lidke (Chapter 8) shows the importance of direct dating to assign the correct cultural attributions when dealing with remains

from megalithic monuments, given the multiperiod use that is often evident. Schulting (Chapter 13) provides a comparable example from a cave context, where direct dating is often the only means of assigning a cultural/chronological affiliation.

With the exceptions of Talheim, Asparn/Schletz, and Herxheim the great majority of cranial injuries discussed in the volume show healing (and in Herxheim the injuries appear to be part of a post-mortem funerary treatment). It may be then, that the death of the individual was not necessarily sought. A variety of reasons can be put forward for this. One often mentioned is the idea that disputes both within and between communities might on occasion be resolved by formal, ritualized, non-lethal combat (Walker 1989; Lambert 1997; Standen and Arriaza 2000; Schulting and Wysocki 2005). Papathanasiou (Chapter 14) draws on this explanation here, and in her case it receives some support from the location of injuries predominantly to the left side of the head, as would be expected for face to face encounters between right-handed antagonists. In Oosterbeek and Tomé's Portuguese material (Chapter 16), on the other hand, the cranial injuries, while healed, are predominantly to the rear of the head, which suggests a very different context. Unhealed cranial injuries at Asparn/Schletz are approximately equally divided between the left and right sides, which Techler-Nicola (Chapter 6) interprets in the context of a surprise attack. Thus, it is clear that the idea of formal encounters cannot be applied indiscriminately as an explanation. Other possibilities include accidents and sporting contests, as well as domestic violence—though here again there would be an expectation of injuries concentrating on the front of the head, and particularly to the left side, as seen in modern cases (Walker 1997; Le *et al.* 2001; Rogers 2004). However, it is important to emphasize that no doubt at least some of the observed healed injuries were of lethal intent, even though the victim survived. Perhaps aid was close at hand, for example, and the aggressor was unable to deliver the killing blow. This is almost certainly the case with arrow injuries from San Juan ante Portam Latinam, where more than half the examples of embedded points show healing. Similarly, Beyneix (Chapter 12) discusses a number of cases of healing projectile injuries from France.

Another issue deserving close attention is the age and sex distribution of individuals affected by violence compared with the total burial population. In some cases, adult males do show a higher prevalence of injury or suggested violence, both at the level of the

individual site, and across regions as a whole. An interesting example presented by Beyneix (Chapter 12) is Pontharaud in south-central France, with a mass grave containing five males and two adolescents of indeterminate sex: while only one individual was definitely killed by a projectile point, the simultaneous burial of the group suggests a violent end for all, recalling the discussion above on the interpretation of mass graves. At a regional level, Lidke (Chapter 8) and Lorkiewicz (Chapter 4) report violent cranial injuries affecting mainly males in northern Germany and Poland, respectively. Similarly, Silva *et al.*'s overview (Chapter 17) of Late Neolithic Portugal reports approximately twice as many males affected by cranial trauma as females. In addition, over Europe as a whole, the overwhelming dominance of males among those struck by projectiles is clear, both from the chapters in this volume and from the wider literature (Guilaine and Zammit 2001; Schulting 2006). Nevertheless, equally, the studies in this volume clearly demonstrate that interpersonal violence did not only affect adult males. Whether women and children were simply victims or at times even aggressors themselves may not always be possible to establish, though Fibiger's study (Chapter 10) of cranial injuries suggests the former, at least for the Wartberg Culture of Late Neolithic Germany. More widely, some of the cases discussed in this volume may represent domestic or other forms of intracommunity violence—the majority of cranial injuries for both sexes show healing—while in other cases, it may have been a matter of being in the wrong place at the wrong time. Revenge killings feature prominently in the ethnographic literature for small-scale societies and it often matters little whether the target is a man, woman, or child (Chagnon 1988; Keeley 1996; Maschner and Reedy-Maschner 1998; Otterbein 2000). Indeed, defenceless victims may be preferred, as they offer less risk of injury to the perpetrators, while still satisfying the requirements of blood vengeance.

The central question posed in the conference on which this volume is based was the extent and nature of the skeletal evidence for interpersonal violence in different regions of Neolithic Europe. Those *not* showing injuries are as much a part of the story as those exhibiting trauma. While site-based studies—such as those carried out for Talheim, Asparn-Schletz, Herxheim, and San Juan ante Portam Latinam—offer essential insights into the scale and context of violence during the period, it is only through larger-scale, regional comparisons that we will begin to understand the true prevalence of

violent interaction and its wider-reaching demographic, economic, and social effects throughout the European Neolithic. While the current volume by no means presents the final word we feel that it provides a good starting point from which to address these issues.

ACKNOWLEDGEMENTS

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The placement of the feathers: violence among Sub-boreal foragers from Gotland, central Baltic Sea

Torbjörn Ahlström and Petra Molnar

ABSTRACT

This chapter explores the occurrence of cranial trauma in a sub-Neolithic maritime hunter-gatherer population from the island of Gotland, located in the central Baltic Sea. The material derives from cemeteries of the Pitted Ware Culture, the last hunter-gatherers of southern Scandinavia. A total of 109 adult crania were analysed (57 males and 52 females). Skeletal trauma could be identified in eight males (14.0%) and four females (7.7%), with only one female skull showing unhealed and probably lethal trauma. It is difficult to translate skeletal descriptors of trauma into general descriptors of violence in past societies, as we cannot estimate soft tissue damage; furthermore, our sample is biased towards skeletons from cemeteries, embracing only individuals that received this treatment and not necessarily all participants in a conflict. None the less, this analysis of human skeletal remains from the last hunter-gatherers demonstrates that violence was most probably present in the society. One noteworthy feature of the male trauma is a circular depression that could have been produced with an antler club. Today, given the abundant literature demonstrating the presence of violence among foragers, it is a moot point to uphold the view that foragers are peaceful and farmers are violent. The economical distinction no longer has explanatory power. We have to seek other explanations,

and here we discuss a demographic explanation based on the concept of ‘youth bulges’ within the population. A youth bulge is the consequence of increased survival for subadult individuals, proportionally increasing the base of the population pyramid.

INTRODUCTION

Figure 2.1 shows a scene from a petroglyph located by the Vyg River, northwestern Russia. These petroglyphs are broadly dated to 4000–500 BC (Bradley *et al.* 2001). This particular example shows a person with a bow surrounded by a substantial number of arrows. When this rock carving was described by Vladislav Ravdonikas (1938), he chooses to interpret the ‘trident’-like end of the arrows as representing the arrowheads. Except for the arrow approaching the person just in front of the bow, all other arrows are dislodged from the person in a massive broadside. Clearly, this must be a scene with symbolic connotations. However, as pointed out by Gustaf Hallström (1960), the logical explanation of trident-like ends of the arrows is that they represent the feathered end, with the arrowhead at the opposite end, hence the title of this chapter. Now the interpretation of the scene shifts from unintelligible symbolism to a portrait of a possible homicide, with a substantial overkill as 10 arrows are lodged into or approaching the person at the centre. A similar situation involving arrowhead finds in close association with a buried individual has been reported from grave 33, Skateholm I, Sweden (Larsson 1982). In fact, Ahlström (2008) demonstrated that the individual from grave 33 is associated with a healed scalping as well. The example from Vyg elegantly captures the ambiguities inherent in archaeological interpretations, depending on the perspective of the beholder. Is this important? At stake here is the issue of whether violence and warfare is a cultural construct (nurture) or part of the human behavioural repertoire with biological roots (nature), though this problem is probably never amenable to such a simplistic classification.

The question of violence and warfare in prehistory is largely ideologically determined. In this chapter, we focus on foragers from approximately the same date as the petroglyph from Vyg. The Pitted Ware culture (PWC) is dated to 3500 to 2600 BC (cf. Figure 2.2). Our contribution focuses on the pattern of cranial trauma among skeletal



Figure 2.1. Figure from the Vyg petroglyph (after Hallström 1938).

remains from Gotland, central Baltic Sea, and the question of whether violence and low-intensity warfare were a part of existence among these last hunter-gatherers of southern Scandinavia.

SUB-BOREAL HUNTER-GATHERERS IN SOUTHERN SCANDINAVIA

It is appropriate to give a short introduction to the Neolithic of northern Europe, as this period is manifested somewhat differently compared with continental Europe. It is generally assumed that a Neolithic mode of production was introduced in southern Scandinavia at about 4000 BC (Figure 2.2, upper panel). This period is referred to as the Funnel Beaker Culture (or *Trichterrandbecher*, TRB). The material culture of the TRB is compatible with that of an agro-pastoral economy, with domesticated cereals and animals (sheep, pig, and cow) (Welinder *et al.* 1998). Other aspects of the material culture include megalithic tombs (dolmens and passage-tombs) and causewayed enclosures. The observed shift in economy is similar to other areas of Europe. The TRB was preceded by the Late Mesolithic Ertebølle Culture (5700–3800 BC). The interpretation generally accepted by Scandinavian archaeologists is that the Mesolithic

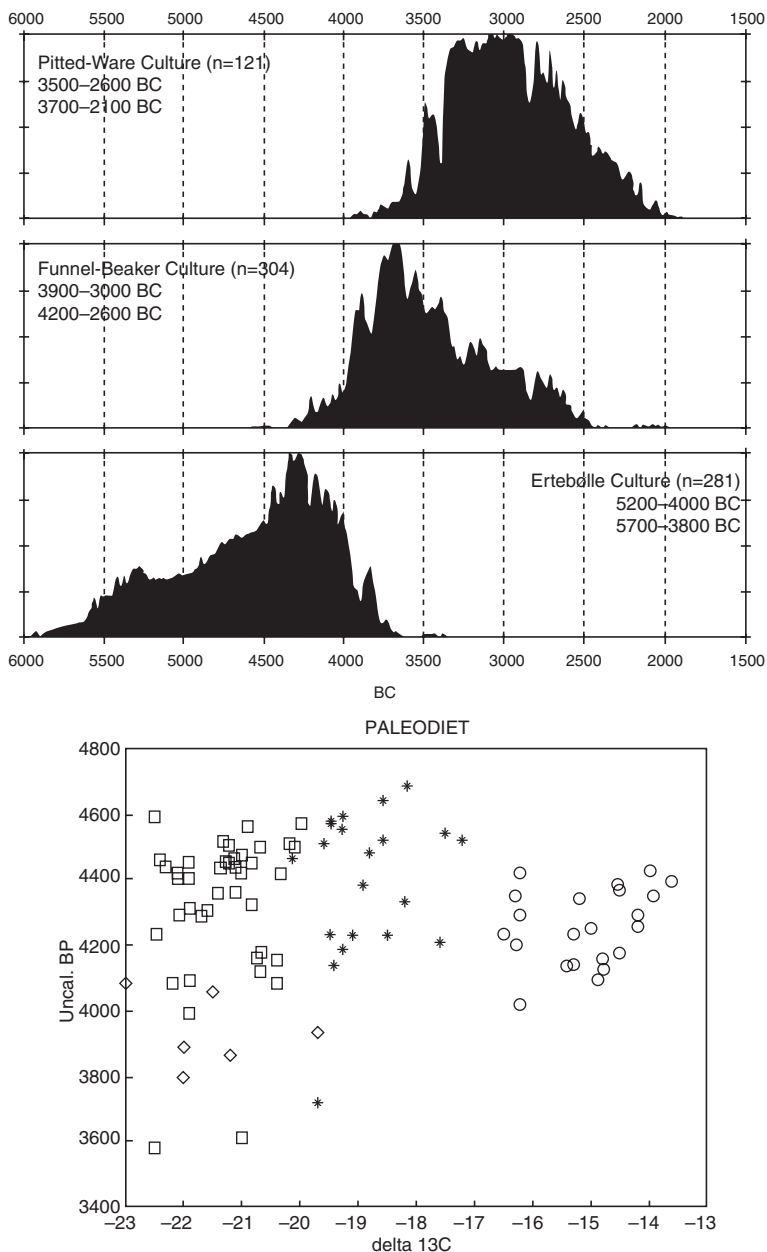


Figure 2.2. The upper panel displays calibrated radiocarbon dates categorized according to cultural group (data from Persson 1999). The lower panel displays a bivariate plot of uncalibrated radiocarbon dates and $\delta^{13}\text{C}$ values from human skeletal data (unfilled circles, PWC; unfilled squares, TRB inland megalithic tombs; stars, TRB coastal megalithic tombs; rhombs, Battle-Axe Culture) (Data from several sources, cf. Ahlström 2009).

maritime adaptation characterizing the Ertebølle is phased out in favour of a Neolithic mode of production and that this was an indigenous development within southern Scandinavia. Thus, the archaeological record in southern Scandinavia seems to correspond to the general development on the continent, an agro-pastoral way of life replacing a foraging one. However, in Scandinavia we experience yet another shift at about 3500 BC, when a maritime hunter-gatherer population reappears alongside farming communities in parts of southern Scandinavia. This material culture is referred to as the sub-Neolithic PWC, the term sub-Neolithic denoting a population living in close proximity to farming communities but retaining a hunter-gatherer way of life.

A summary of the material culture attributed to the PWC is supplied in Figures 2.3 and 2.4. The ceramics defined are characterized by an excess of pits applied in linear patterns, or lines arranged in a zigzag pattern, on the exterior surface of the vessels (Figure 2.3). Ceramic vessels have pointed bottoms, which could mean they were designed to be transported in canoes, although no contemporary canoe has been found. A mobile way of life is implicated with respect to the excavated settlement sites, as only smaller huts have been found and no larger constructions are evident, suggesting permanent settlements. Bone harpoons are abundant on coastal settlements and reflect sealing activities. Another typical artefact found in the same contexts is bone hooks for fishing.

Projectiles (both arrows and spears), ulus, and knives were manufactured from slate, a common denominator for eastern and circum-polar hunter-gatherer groups. In southern Scandinavia, where flint is abundant, triangular projectiles were manufactured based on a typical core technique. From mainland Sweden, we know of a bone comb with an elk-head, a ceremonial elk-head axe, and an elk modelled in clay that all bear witness to the importance placed on this prey. At the shores of the Litorina Sea (the more marine stage of the Baltic Sea), we find evidence for an economy dominated by seals, fish, and game. The dietary range of these groups is summarized in Figure 2.2 (lower panel). Samples derived from PWC contexts are more marine compared with samples from TRB contexts (inland as well as coastal megalithic tombs). The majority of skeletal remains from PWC contexts derive from the island of Gotland, and form the focus of the present study.



Figure 2.3. Typical ceramics with pits attributed to the Pitted Ware Culture (not to scale).

Gotland is in the middle of the Baltic Sea, with a limestone bedrock rich in carbonates. This produces optimal conditions for the preservation of bone. The approximate shoreline 5000 years ago (10 m above the present shoreline) is shown along with, for our purpose, relevant archaeological sites in Figure 2.5. Since the discovery of a Stone Age site below the medieval cultural layers in the town of Visby, in 1863, several sites have been discovered along shorelines of the former Litorina Sea. They have been attributed to PWC, based on ceramics and artefacts made out of flint and slate. Associated with almost every site are concentrations of graves that can be termed proper cemeteries. Skeletons from Gotland constitute the PWC contexts portrayed in Figure 2.2b (circles). The animal bone material from Gotland is dominated by seals (grey, harbour, and harp) and fish bones, but also pigs. However, there is minimal trace of the consumption of pigs with respect to stable isotope analysis (Eriksson

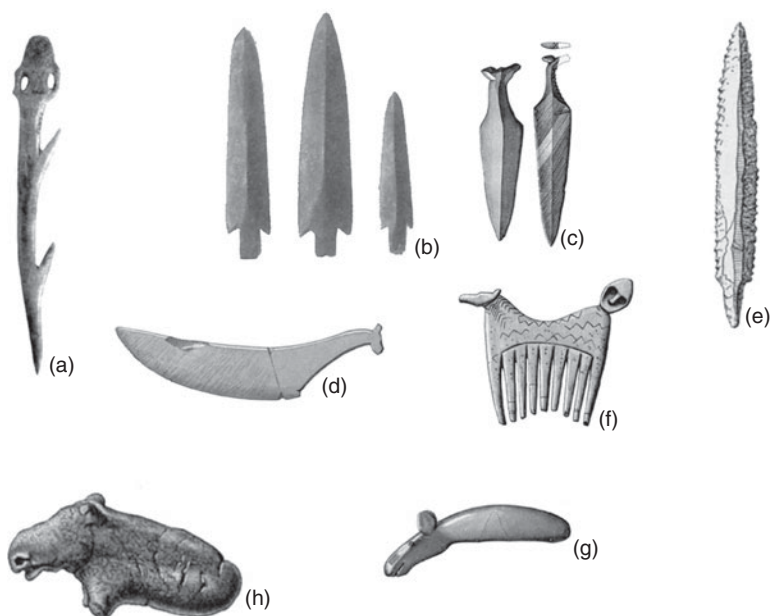


Figure 2.4. Artefacts attributed to the Pitted Ware Culture. (a) Bone harpoon; (b) slate projectiles; (c) slate knives; (d) slate 'ulu'; (e) triangular flint projectile; (f) bone comb; (g) ceremonial elk-head axe; (h) elk modelled in clay. Note the recurrent elk theme present in artefacts c, d, f, g, and h (not to scale).

2003). From multiple lines of evidence, the PWC represents the last hunter-gatherers in southern Scandinavia.

The purpose of this contribution is to evaluate the frequency of cranial trauma in PWC skeletal remains from Gotland and discuss the nature of the trauma: does it represent evidence for violence? It should be mentioned that postcranial trauma, fractures, and pseudoarthrosis, exist in the material, but are not part of the present analysis.

MATERIALS AND METHODS

Our sample of adult individuals is listed in Table 2.1. In all, 52 females and 57 males were subjected to analysis. Sex estimations



Figure 2.5. The island of Gotland, Central Baltic Sea, with the shoreline some 10 m above the present shoreline indicated. The sites mentioned in the text are marked.

were performed in accordance with modern standards (Buikstra and Ubelaker 1994). Trauma is defined as the influence of external forces on the human body, whether this is physical/mechanical, thermal, or chemical. As osteologists, we are able to identify physical trauma as bone fractures, whether blunt, sharp, or caused by projectiles. We restrict our analysis to cranial trauma. This is not to say that post-cranial trauma is irrelevant, but the distinction between accidents or violence is more difficult to achieve. A parry fracture may be the result of fencing off an assailant, but could result from a fall as well. One may hypothesize that in the absence of metals and effective body armour, the head is the main target, as a blow to it would incapacitate the affected individual. We are specifically looking for fractures of the

Table 2.1 Composition of the material with respect to sex and site.

Site	Males	Females
1. Ajvide, Eksta parish	16	13
2. Fridtorp, Västerhejde parish	0	9
3. Ihre, Hangvar parish	5	7
4. Visby, Visby town	20	7
5. Västerbjers, Gothem parish	16	16
Σ	57	52

external cranial surface, fracture lines, depressions, and internal bevelling on the endocranial surface. Peri-mortem trauma may easily be confused with taphonomic factors, such as post-mortem fragmentation. This introduces bias as we easily recognize healed trauma but may face difficulties in identifying peri-mortem trauma; however, careful analysis according to well-defined forensic criteria can minimize this bias.

RESULTS

Of the 109 skulls examined, 12 (11.0%) showed lesions of traumatic origin (Table 2.2). These are described below according to site. No traumatic lesions were documented in the material from Fridtorp, Västerhejde parish.

Ajvide, Eksta parish

Two skulls, both determined as males, from Ajvide display minor trauma (graves 59 and 67). The skull from grave 59 is fragmentary.

Table 2.2 Results: cranial trauma.

	MALE	FEMALE
Total	57	52
With head trauma	8 (14.0 %)	4 (7.7 %)
Healed head trauma	8	3
With lethal trauma	0	1

A healed lesion in the form of a depression was present on the frontal bone, adjacent to the coronal suture. There is no endocranial involvement at the site of the lesion. With respect to grave 67, there is a minute depression on the left parietal bone, without endocranial involvement. Concerning grave 59, the lesion could have been produced by blunt force, but this is not likely in grave 67. Here, a shallow but penetrating trauma is more likely, similar to, but not as extensive as the trauma present in Västerbjers Hearth 76 (below). There is also a notion in the literature of a shallow depression near lambda with respect to grave 41, a female (Persson and Persson 1997). We were unable to confirm this upon reanalysis of the material.

Ihre, Hangvar parish

Of the 12 crania from Ihre, there is one that merits further comment. Gejvall (1974) reported previously that the perforation of the right temporal bone belonging to the female in grave 6B (2/57) could have been traumatic in origin (Figure 2.6). However, it should be remembered that this portion of the skull is fragile and prone to natural breakage. We believe that taphonomic processes are responsible for this damage. No other trauma was found at Ihre.

Visby, Visby town

Three individuals from Visby display trauma. One female (Sk 1/1924) shows a 1×0.5 cm incision on the right frontal bone, approximately 0.5 cm from the median sagittal plane and 3 cm from the orbital margin. One male (Sk 4/1909) exhibits a barely discernable depression, approximately 2 cm in diameter, in the left frontal bone adjacent to the coronal suture. A second male (SHM23109:2) shows a small depression (1 cm in diameter) on the right parietal bone, 5 cm from the sagittal suture and level with the foramen parietalia. All lesions from Visby were healed.

Västerbjers, Gothen parish

In all, six individuals from Västerbjers reveal trauma to the head. One female (Gr 3a/1933) displays a small depression with smooth margins on the right parietal bone, just above the superior temporal line. Another female (20200:2), found in the gravel pit, has an impression



Figure 2.6. Ihre, Hangvar parish, grave 6b (2/57). Gejvall (1974) interpreted the perforation of the right temporal as traumatic in origin. We interpret this feature as taphonomic.

fracture on the right parietal bone, immediately posterior to the coronal suture and about 4 cm lateral to the sagittal suture. A large portion of bone has been detached endocranially. There are no signs of healing, suggesting this trauma was lethal (Figure 2.7). Of the four males, the grave referred to as Hearth 76 is the most conspicuous (Figure 2.8). A depression with a diameter of 2 cm can be seen on the medial portion of the frontal bone. This skull was immediately adjacent to a construction interpreted as a hearth. Apart from the skull and some vertebrae, no other skeletal elements belonging to this individual were in the vicinity. The skeletal remains are unburnt. A similar depression can be found with respect to the male in grave 61 (Figure 2.9), where we note a 1-cm depression on the left parietal bone adjacent to the superior temporal line, and the male in grave 66:2, where we note a depression immediately anterior of bregma. Lastly, there is a bony projection on the left parietal bone from grave 6, which could be traumatic in origin.

In total, skeletal trauma could be substantiated in eight males (14.0%) and four females (7.7%), the occurrence of trauma being homogeneous between the sexes (Fisher's exact test ($P = 0.3659$)). The most common form of trauma was the depressed circular feature, present among seven males and two females. One type of artefact that

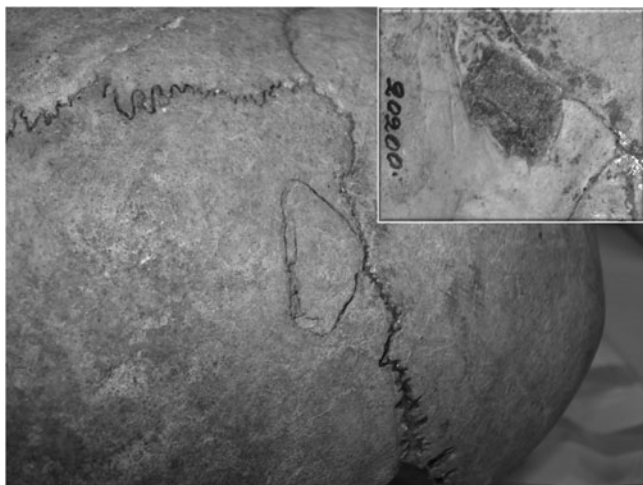


Figure 2.7. Västerbjers, Gothen parish. 20200:2. Adult female with impression fracture on the right parietal bone, immediately posterior of the coronal suture and about 4 cm lateral to the sagittal suture. A large portion of the bone has been detached endocranially (inset). No signs of healing suggesting lethal trauma.

could explain this form of trauma is antler clubs (Figure 2.10). Sven Nilsson (1838–43) described a find of an antler club still embedded in a skull from Tygelsjö, south of Malmö (Figure 2.11). This find is not dated but the type of club is similar to the ones we find in PWC contexts. This type of weapon is lethal and it is remarkable to see the level of survival displayed by some of the individuals, especially Hearth 76 from Västerbjers. It is reasonable to assume that the nature of trauma this individual was subjected to produced damage to the brain, though we cannot be certain of this. However, the nature of the burial, where the excavator wrongly identified the grave as a hearth, may indicate that the society did not treat this individual according to the same practices common for other deceased members of society. It is also possible that the circular type of trauma was produced by wooden clubs that do not survive in the archaeological record. The only lethal trauma found is not of the same type, and this depression fracture was probably not produced by the sharp edge of a weapon (Västerbjers 20200:2). One could hypothesize that this wound was caused by tangential violence, perhaps an axe shaft or a straight

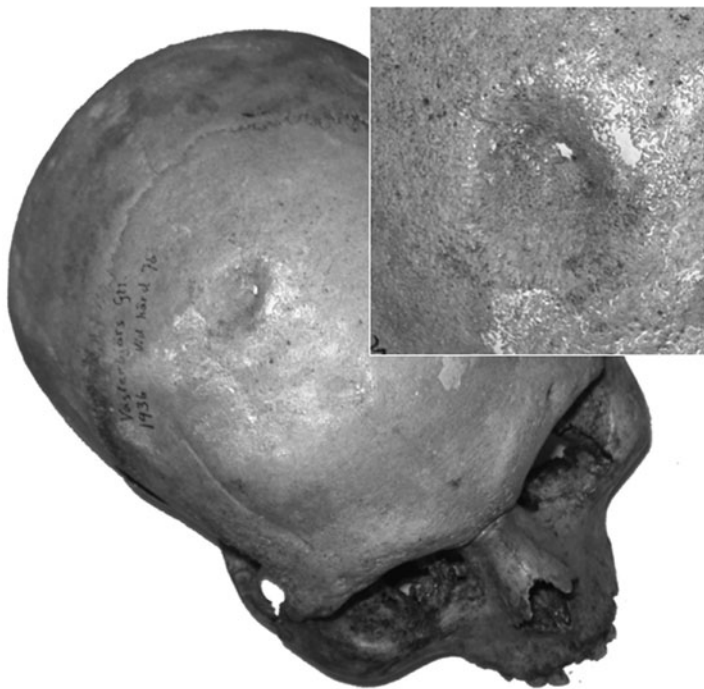


Figure 2.8. Västerbjers, Gothem parish. Hearth 76. A 2×2 cm crater in the medial portion of the frontal bone, healed.

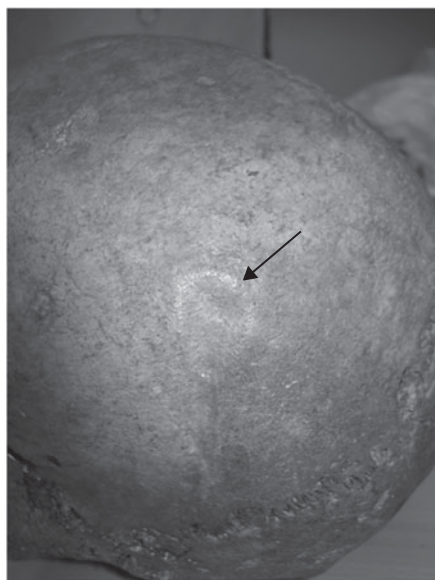


Figure 2.9. Västerbjers, Gothem parish. Grave 61. A 1×1 cm depression on the left parietal bone, adjacent to the linea temporalis superior.



Figure 2.10. Antler club. Grave 65, Västerbjers, Gotland (Stenberger 1943).

wooden object. However, the demise of this individual could be the result of an accident (e.g. a fall).

DISCUSSION

There is a hierarchy with respect to interpersonal violence and the nature of skeletal evidence. Sharp trauma in terms of a projectile—complete or incomplete—still embedded in bone, or blunt force where the impact zone can be matched with a contemporary artefact, are to be regarded as the strongest evidence for interpersonal violence. It is important to note that no projectiles have been found embedded in bone from PWC contexts from Gotland. We have also looked for flint, which is abundant on Gotland, and slate fragments embedded in the bones, but found none. What we have here are lesions that could have been produced by contemporary artefacts such as antler clubs. There are some caveats to be discussed before



Figure 2.11. Tygelsjö-find, Scania. Antler club (right), originally embedded in the skull (left).

we finalize our interpretations of this material. All individuals studied have in common that they derive from cemeteries and that their traumatic lesions were healed with one possible exception from Västerbjers (i.e. no. 20200). A burial would imply that at least some social cohesion was operating within the society, and further, what we see here are the survivors. Individuals that fell away from the settlements would probably not be found in the cemeteries. Likewise, if settlements were raided and inhabitants annihilated, there would be no one around to bury the dead. Further, we cannot estimate the impact of lesions that affected the soft tissues only. Thus, it is difficult to translate the skeletal descriptors of trauma into general descriptors of violence in past societies (i.e. it is underestimating the true prevalence of trauma). One noteworthy feature of the observed male trauma is the circular depressions that could have been produced by antler (or wooden) clubs (cf. Figure 2.10). The nature of trauma produced by this type of weaponry, as opposed to straight clubs used by for instance, the Yanomamö (Chagnon 1992, p.187), is potentially

lethal, making it less likely that this was a part of a 'ritualized warfare'. This analysis of human skeletal remains from the last hunter-gatherers demonstrates that violence was most probably present in the society.

Why is this important? For a long time, the Hobbesian/Rousseauian dichotomy has dominated the perspectives on violence and hunter-gatherers. According to Jean-Jacques Rousseau, there was a stage in human evolution during which humans peacefully coexisted without resorting to violence and war. Accordingly, violence as a cultural construct arose in concert with civilization, and before this, humans existed in a 'Garden of Eden'. In a similar vein, writers such as Ashley Montagu (1978a,b) have written about violence/warfare in terms of nurture and subsequently, a facet of the human existence that could be manipulated by means of pedagogy. Childhood socialization incorporating non-violent behaviour, rather than violence, would bring about serenity, according to Montagu. Of course, certain aspects of warfare—strategy, tactics, and weaponry—are cultural, but what about violent behaviour and its link to biology and aggression? Violence is a part of the social fabric among primates (see Nystrom 2005 for references), which has been noted by several authors (Wrangham and Peterson 1997; Ghiglieri 1999; Wrangham *et al.* 2006), and the idea of a *tabula rasa* changed by human socialization has been questioned (Pinker 2007). So perhaps there are no *a priori* reasons to believe that foragers are non-violent? Thomas Hobbes' view on human existence is diametrically opposed to the one endorsed by Rousseau. He claims that civilization pacifies humanity from a primordial situation that was 'nasty, brutish, and short'. Given the recent plethora of literature on the topic of violence among hunter-gatherers (cf. Keeley, 1996; Kelly 2000; LeBlanc and Register 2004; Guilaine and Zammit 2005), it is unproblematic to see that both Rousseau and Hobbes were correct, and at the same time, wrong. Violence was a part of the behavioural repertoire of 'primordial' foragers and 'civilized' farmers, along with the propensity for cooperation. We now have to shift focus from the Hobbesian/Rousseauian dichotomy on the subject of presence and pattern of interpersonal violence and warfare in prehistoric societies, which originally shaped much of the archaeological debate. Refraining from the vain attempt to identify a 'Garden of Eden' in human evolution, we now have to shift focus towards questioning under which circumstances violence and warfare dominate social interactions among populations.

It is obvious that the economic distinction encapsulating forager-farmer dichotomy no longer provides us with a satisfactory explanation. Both foragers and farmers at times resort to violence. We have to seek other explanations, and here we discuss a demographic explanation based on the concept of youth bulges. A youth bulge is the result of population growth whereby proportionally more young people face the situation of establishing themselves in a shrinking social arena, defined by adults. That is, the base of the population pyramid is increasing in size. Moller (1968) identifies this as a potential source for social unrest. But can we accept the notion of population growth among foragers? There is a strong belief among anthropologists/archaeologists that foragers are able to reduce population growth and stabilize population numbers at a level corresponding to an optimum. However, this view was effectively deconstructed by Wood (1998), showing that growing populations, or populations prone to growth, have no mechanisms to identify optimal population size. We believe that the concept of youth bulges provides an interpretative framework worth pursuing in the future.

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Violence in the Stone Age from an eastern Baltic perspective

Rimantas Jankauskas

ABSTRACT

The Stone Age in the eastern Baltic, embracing both the Mesolithic (ca. 10 000–6500/6300 BP) and Neolithic (ca. 6500/6300–3500 BP), differs from traditional models. The Mesolithic saw a gradual increase in population size, more settled communities, development of a more complex social structure and ideology, and emergence of local cultures, based on hunting, gathering, and freshwater fishing on inland settlements. In the Neolithic, in this heavily forested area rich with fishing resources, notwithstanding some ‘external’ elements of Neolithization, foraging economies persisted. Increasing evidence indicates a very gradual transition to farming by indigenous hunter–fisher–gatherers via contacts ca. 6500–4000 BP. Only in the period of ca. 4000–2500 BP, considered already as the Bronze Age, did the final transition to agriculture take place. To determine possible traces of violence, all available skeletons from Lithuania (26) and the Latvian site of Zvejnieki (223) were examined. In general, the overwhelming majority of traumas can be considered as ‘casual’, resulting from everyday activities. Cases of circumscribed inflammatory lesions on skull vaults of five males and one trephination could be a reflection of rituals related to a complex social hierarchy in ‘delayed return’ communities. Only complex sites of settlements and several burials of young males from the Late Bronze Age contain evidence of violent deaths.

INTRODUCTION

Recently proposed hypotheses that have more and more supportive data stress the differences in Neolithization processes in northeast Europe in comparison with other parts of the continent. The local Neolithic in Lithuania and Latvia (ca. 5500/5300–2000 BC) to a large extent was a continuation of previous Mesolithic traditions; according to Zvelebil (1998), the transition to agriculture in the eastern Baltic region could span up to 2500 years, and occurred mostly via cultural diffusion. There was a very gradual increase in population size, occurrence of settled communities, development of a more complex social structure and ideology, and emergence of local cultures as an adaptation to local conditions, based on hunting, gathering, and freshwater fishing on inland settlements. In a heavily forested area, particularly rich in fishing resources, conditions for agriculture were not advantageous, thus notwithstanding some ‘external’ elements of Neolithization, foraging economies persisted. To define this cultural phenomenon, terms such as ‘paraneolithic’, ‘subneolithic’, ‘ceramic Mesolithic’, and ‘forest Neolithic’ were coined. These foragers, however, experienced complex interactions with southern farmers. The Zedmar culture, for example, considered as an Eastern-most derivative of ‘Western’ origins (Bromme-Lyngby, Ahrensburg, Ertebølle), was the first to experience such interactions, sometimes being considered as a ‘poor relative’ of southern farmers. Signals of subsistence and population continuity can be traced by ancient mitochondrial DNA analysis as well (Bramanti *et al.* 2009). Evidence of the final transition to agriculture in the eastern Baltic occurred only in the Early Bronze Age, ca. 1800 BP (Daugnora and Girininkas 1996; Antanaitis 2001; Antanaitis-Jacobs *et al.* 2009). All of this suggests we should not expect dramatic changes in the occurrence of trauma, nor in overall health status indices, over the period studied. On the other hand, the economic system of Baltic foragers to a certain degree at least had to be based on delayed return due to climatic seasonality (cf. Testart 1982), causing a considerable degree of social complexity reflected in complex burial customs (Zagorskis 1987; Jacobs 1995). This in turn would suggest possible differences in health profile and trauma patterns that may be related to social status. For further reference, an approximate chronology of the area is shown in Table 3.1.

Table 3.1. Lithuanian and Latvian Stone and Bronze Age chronology (from Antanaitis-Jacobs *et al.* 2009; Girininkas, 2009)

Archaeological Period	Defining feature of archaeological period	14 C years BP	Cal BC	Environmental period, years BP
Late Mesolithic	Post-glacial and pre-Neolithic hunter-gatherers of Atlantic period: Kunda, Narva, Nemunas, Janislawice cultures	ca. 8000–6550/6300	5900–5500/5300	Early Atlantic (8000–6700) and beginning of Late Atlantic (6700–5000); formation of Littorina Sea
Early Neolithic	Appearance of (Narva and Nemunas Culture) ceramics (Late Mesolithic in Scandinavia)	6550/6300–5600/5400	5500/5300–4400/4200	Late Atlantic
Middle Neolithic	Appearance of Comb-and-Pit Pottery culture	5600/5400–4400/4300	4400/4200–3100/2900	Late Atlantic–Early Subboreal (5000–4000)
Late Neolithic	Appearance of Corded Ware culture	4400/4300–3500	3100/2900–2000	Middle/Late Subboreal (4000–2500)
Early Bronze Age	First metal objects	3500–3100	2000–1600	Late Subboreal
Late Bronze Age	New kinds of bronze objects, cremations or earliest barrows with stone constructions, appearance of hill forts	3100–2500	1600–500	Late Subboreal; at end of Subboreal, Littorina Sea changes into <i>Limnea Sea</i>

The aim of this chapter is to focus on traces of violence found on Lithuanian and Latvian Stone Age skeletal materials in light of the above-mentioned hypotheses.

AREA AND MATERIALS

The Zvejnieki Stone Age complex (57°N, 25°E), located on the northern shore of Lake Burtnieks, northern Latvia, has been known among archaeologists since the nineteenth century. However, it was thanks to excavations by Dr Francis Zagorskis during 1964–1978 that the site became known internationally (Zagorska 2006a). Well preserved skeletal materials of over 300 graves with grave goods of bone, teeth, and antler, as well as associated settlements, with radiocarbon dates ranging 7310/7050–2890/2620 BC (Zagorska 2006b), were obtained. Extensive analysis of subsistence, including stable isotope analysis, revealed diets based on a considerable intake of freshwater foods with a certain shift in diet, while not to farming, but foods also including substantial contributions of birds and mammals, although still with a considerable intake of fish, in later periods (Eriksson 2006). Considering this, Zvejnieki is a unique burial ground in the East Baltic region. It spans more than 4000 years, covering periods from the Middle Mesolithic to the Bronze/Iron Age. This allows us to perform detailed studies and obtain extensive information about the conditions of life for Stone Age people of the Boreal zone from a primary source of information: the human skeleton. The number of skeletons used for this analysis according to archaeological periodization is given in Table 3.2.

The Donkalnis and Spiginas burial sites are found in west Lithuania's Samogitian Highland, on separate islands in Lake Biržulis; the time span of these burials covers the period from Mesolithic to Late Neolithic (Kunskas *et al.* 1985; Butrimas *et al.* 1992). The Kretuonas site is in eastern Lithuania, at Lake Kretuonas, and contains an Early Neolithic cemetery and Bronze Age settlement (Girininkas *et al.* 1985). The Plinkaigalis individuals were buried in a cemetery in central Lithuania, where most of the graves date from the third to the sixth/seventh centuries AD; however, this study's two individuals date to the Late Neolithic's Boat/Battle Axe Culture of the Corded Ware horizon (Butrimas *et al.* 1985). The Gyvakarai individual from northeastern

Table 3.2. Number of Zvejnieki graves according to archaeological periodization used for current analysis

Period	Subadults	Males	Females	Adults, sex undetermined	Total
Mesolithic	0	2	1	0	3
Late Mesolithic	9	8	6	0	23
Mesolithic/Neolithic transition	14	8	3	0	25
Early Neolithic	1	18	1	0	20
Late Neolithic	2	4	4	0	10
Neolithic	13	30	13	0	56
Stone age	13	38	23	1	75
Bronze/Iron age	2	7	1	1	11
Total	54	115	52	15	223

Lithuania is also ascribed to the Late Neolithic Boat Battle Axe Culture (Tebelškis and Jankauskas 2006). Finally, the chronologically latest materials are from the Late Neolithic–Bronze Age Kirsna–Turlojiškė archaeological complex in southwestern Lithuania (Merkevičius 1998, 2000).

In total, the study sample consisted of 249 individual skeletons (223 from Latvia and 26 from Lithuania) with well-documented archaeological contexts, investigated macroscopically and under low magnification. Sex and age of each individual were determined according to conventional methods (Ferembach *et al.* 1980).

RESULTS AND DISCUSSION

In all Stone and Bronze Age samples analysed, 17 cases of trauma were detected. They are presented below and arranged in approximate chronological order.

- Zvejnieki grave 154, Mesolithic (7730 $\pm$ 70 BP, Ua-3644). Male, 40–45 years. Healed fracture of nasal bones. Tentative cause—direct blow to nasal area.
- Donkalnis grave 3, Mesolithic (5785 $\pm$ 40 BP, CAMS-85220). Female, 25–30 years. Completely healed small blunt injury to skull vault.
- Zvejnieki grave 63, Late Mesolithic. Male, adult-mature. Healed compression fracture of the fourth lumbar vertebra.

- Donkalnis grave 6, Mesolithic/Neolithic? Female, 35–40 years. Healed fracture of the left ulna. Such fractures often occur when a person tries to protect their head from a direct blow (so-called ‘parry fracture’) (Knowles 1983).
- Donkalnis grave 7, Mesolithic/Neolithic? Male, over 45 years. Healed fracture of the right clavicle. Such fractures occur after a heavy fall on a shoulder or arm.
- Zvejnieki grave 114, Mesolithic/Neolithic transition. Male, 20–25 years. Healed compression fracture of the first lumbar vertebra.
- Zvejnieki grave 132, Early Neolithic. Male, 25–35 years. Healed fracture of nasal bones. Tentative cause—direct blow to nasal area.
- Zvejnieki grave 181, Early Neolithic. Male, 35–40 years. Healed impact fracture of the left parietal bone. Tentative cause—direct blow with blunt object on skull vault area.
- Zvejnieki grave 252, Middle Neolithic (5410 $\pm$ 90 BP, OxA-5988). Male, over 50 years. Healed fracture of the left zygomatic process, caused most probably by a blow from a blunt object on left temporal area.
- Zvejnieki grave 220, Neolithic. Male, 35–40 years. Compression fracture of the fourth lumbar vertebra.
- Zvejnieki grave 191, Stone Age. Male, over 50 years. Healed ‘parry’ fracture of the distal third of the right ulna.
- Zvejnieki grave 289, Stone Age. Male, over 50 years. Healed fracture of the distal third of the right ulna—very similar to grave 191.
- Turlojiškė grave 1. Late Bronze age (2835 $\pm$ 55 BP, OxA-5927). Male, 25–30 years. Three impressed fractures without signs of healing on the skull vault (Figure 3.1):
 - (a) elliptic impression (45 $\times$ 20 mm) on the frontal bone, near bregma, crossing the coronal suture and extending into the right parietal, its centre has a shallow groove; the impression has uneven sharp edges with open diploe, the defect on the internal plate is larger than on the outer;
 - (b) oval impression measuring 35 $\times$ 30 mm on the left coronal suture; characteristics of defect the same as (a);
 - (c) elongated defect (28 $\times$ 9 mm) on the left tuber parietale with sharp uneven edges and open diploe. All impressions



Figure 3.1. Turlojiškė grave 1. Late Bronze Age (2835 ± 55 BP, OxA-5927). Male, 25–30 years. Two (out of three) impressed fractures without signs of healing on the skull vault.

are connected by fracture lines. The character of all three lesions suggests that all were caused by a blunt hard instrument(s) and these three blows could be the cause of death.

- Turlojiškė 1998, grave 4. Late Bronze Age (same cultural layer as millet dated 2590 ± 75 BP, Ua-16681). Male, 20–25 years. Skull trauma is probable cause of death (Figure 3.2):
 - (a) a blow with blunt weapon into the right temporal area from the front and side;
 - (b) two immediately following blows into right parietal with blunt weapon with limited surface.
- Kretuonas 1C, Bronze Age, fragments of human skull vault dispersed in the cultural layer of settlement and initially identified as ‘graves 1, 5, and 8’; later study proved them to belong to the same individual—a subadult or young female (Figure 3.3). Two elliptic unhealed fractures of the skull vault; appearance very similar to, for example, Turlojiškė 1. Such blows could also be the cause of death of this individual.



Figure 3.2. Turlojiškė (1998), grave 4. Late Bronze Age. Male, 20–25 years. Skull trauma is the probable cause of death: a blow with blunt weapon into the right temporal area from front and side.



Figure 3.3. Kretuonas 1C, Bronze Age, fragments of human skull vault dispersed in the cultural layer of settlement – subadult or young female. Two elliptic unhealed fractures of the skull vault.

- Zvejnieki grave 148, Bronze/Iron Age. Adult of undetermined sex, over 25 years. Fracture of mid-diaphysis of the right radius with marked deformation and excessive callus and neoarthrosis formation. Right ulna is intact. This should be the consequence of severe trauma (heavy blow to right forearm?) without proper immobilization of the limb later. Individual was partly disabled—was unable to use their right arm to full extent.
- Zvejnieki grave 156, Bronze/Iron Age. Male, 45–50 years. Healed fracture of the right clavicle.

Summing up this review of limb and skull traumas, it is evident that males were experiencing a much more traumatic way of life (see Table 3.3).

Limb and skull fractures were found on skeletons of 10 males, two females, and two individuals of undetermined sex; fractures of lumbar vertebrae were found on three males. Such a sex-specific pattern is characteristic for early forager populations. Minimal presence of traces of violence against women, sometimes noted among other hunter-gatherer populations (Larsen 1997), is evident. A certain trend (albeit statistically insignificant) for a decreasing incidence of trauma among adult males was noted. In the Mesolithic sample, three injuries were found in 20 individuals ($15.0 \pm 8.0\%$), and in the Neolithic sample, correspondingly, four in 54 ($7.4 \pm 3.6\%$). Several researchers have also noted a decrease in the incidence of trauma from the Mesolithic to the Neolithic (Steinbock 1976; Bennike 1985), although such a pattern is not universal (Larsen 1997). Among 18 skull and limb trauma cases listed, 11, using only very loose criteria, could be attributed to consequences of direct violence. This indicates that interpersonal conflicts did not play a major role in the daily life of this population, and, as in western Europe, represent accidental injuries that reflect the hazards of day-to-day living, rather than group conflicts (Meiklejohn *et al.* 1984). Most probably at least some of them were also caused by daily life activities.

Fractures of lumbar vertebrae of three males, as reflections of such hazards, should be discussed separately. This type of fracture, not common in other populations, in Inuit populations occurs from riding on sledges across rough terrain and accidental falls on ice (Merbs 1983). As there is no other evidence of sledge use in Zvejnieki, the most probable cause of such fractures might be attributed to, for example, accidents on ice during winter fishing.

Table 3.3. Summary of traumas in Lithuanian and Latvian Stone and Bronze Age materials

Region	Males	Females	Sex undetermined
Skull vault	3	1	1
Face	3	0	0
Upper limb	4	1	1
Lower limb	0	0	0
Axial skeleton	3	0	0
Total	13	2	2

Three cases of ante-mortem broken front teeth (from 1 to 3) should also be considered as consequences of daily activities and use of teeth as a tool—especially when specific lateral dental attrition ('chipping'), high degree of anterior dental attrition and high incidence of *in vivo* front tooth loss are taken into account (Palubeckaitė and Jankauskas 2006).

Another set of changes more difficult to interpret are five cases of healed periosteal reactions on skull vaults. In all five cases, these are adult and mature males, and in three cases, males buried in close vicinity to one another are involved.

- Zvejnieki grave 63, Late Mesolithic. Male, 50–55 years. Broad area of irregularities with several deeper pits with barely definable margins. Both parietal bones (above temporal line) and part of frontal are involved (Figure 3.4). Other pathologies include severe osteoarthritis of the left shoulder joint and a healed fracture of the fourth lumbar vertebra. Grave contained no inventory.
- Donkalis grave 4, Late Mesolithic (6995 $\pm$ 65 BP, OxA-5924). Male, 50–55 years. Area of irregularities (signs of healed inflammation) with clear margins on skull vault (Figure 3.5), embracing occipital squama, and both on the right side and possible post-traumatic arthritis of the left wrist joint. The grave contained 83 animal tooth pendants.
- Zvejnieki grave 300, Early Neolithic (5690 $\pm$ 45 BP, Ua-3642). Male, 30–35 years. Circumscribed, elongated oval-shaped area of pitting, slightly elevated above intact bone surface, with identifiable margins, embracing part of frontal bone and both parietals along the sagittal suture was noted (Figure 3.6). Burial

contained numerous grave goods (tooth pendants, bone arrow-heads, harpoon, and knife).

- Zvejnieki grave 289, 'Stone Age'. Male, over 50 years. Very similar elongated diamond-oval-shaped elevated area of pitting in the same location. Healed fracture of the right ulna. Burial contained no grave goods.
- Zvejnieki grave 297, 'Stone Age'. Male, 40–45 years. Elongated oval-shaped area of pitting and irregularities (shallow longitudinal grooves). No grave goods in excavated part of the grave.

In all cases, the morphology of the changes is suggestive of healed inflammation. Such inflammatory changes could be caused by direct infection on the scalp area. Cases of healed scalping wounds are known from literature: Steinbock (1976) presents a case of possible healed scalping in an adult male Amerindian from Arkansas with a sharply circumscribed area of osteitis. Scalping was widespread over Eurasia in ancient times, and is related to the archetype of beliefs in hair's magical properties (for discussion and review of archaeological



Figure 3.4. Zvejnieki grave 63, Late Mesolithic, male 50–55 years. Area of healed osteoperiostitis on frontal and both parietal bones.

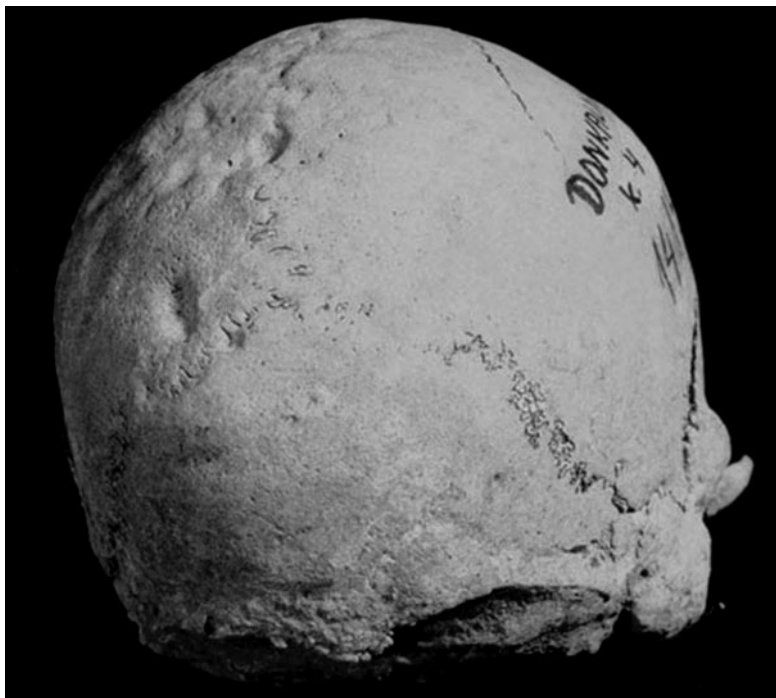


Figure 3.5. Donkalnis grave 4, Late Mesolithic (6995 ± 65 BP, OxA-5924), male, 50–55 years. Area of irregularities (signs of healed inflammation) with clear margins on skull vault, embracing occipital squama and both parietals.

and written sources, including Scandinavian cases, see Mednikova 2002). In addition, During and Nilsson (1991) present a case of unhealed Neolithic scalping from southern Sweden. However, as the periosteal layer is removed during scalping, subsequent granulation of the necrotic area produces a slightly depressed region (Steinbock 1976). Thus, some kind of “milder” traumatic event causing an infection of the scalp (cauterization? tattooing?) must be involved. These cases could be suggestive of complex rituals related to social structure: all five individuals are mature or even senile males, two of them having severe pathologies of shoulder joints and forearms, and including two graves with exceptionally rich inventories.

Finally, a unique case of trephination must be noted. The skull vault of a male (burial 227, disturbed, tentatively dated to the Late Neolithic) bears three large overlapping openings. The openings on



Figure 3.6. Zvejnieki grave 300, Early Neolithic (5690 ± 45 BP, Ua-3642), male, 30–35 years. Circumscribed elongated oval-shaped area of pitting, slightly elevated above intact bone surface, with identifiable margins, on frontal and both parietal bones.

the external plate are substantially larger, indicating that intervention was performed by the scraping technique. The diploe is completely closed by compact bone, which proves that intervention was performed when the individual was alive and had completely healed (i.e. the individual survived this intervention for at least several months) (Figure 3.7).

Archaeological and osteological data suggest that the situation began to change significantly with the onset of the Bronze Age. Late Bronze Age cases from Lithuania (Turlojiškė and Kretuonas 1C) most probably indicate another reality: all six Turlojiškė individuals discovered so far are young or adult males, and from four skulls available for analysis two bear clear signs of violent death; another case from Kretuonas 1C with very similar lesions is probably not just an occasional coincidence. It should be noted that these are remains of ‘true’ agriculturalists. Taking into account the entire complex of changes (i.e. climatic, technological, and subsistence, which may have

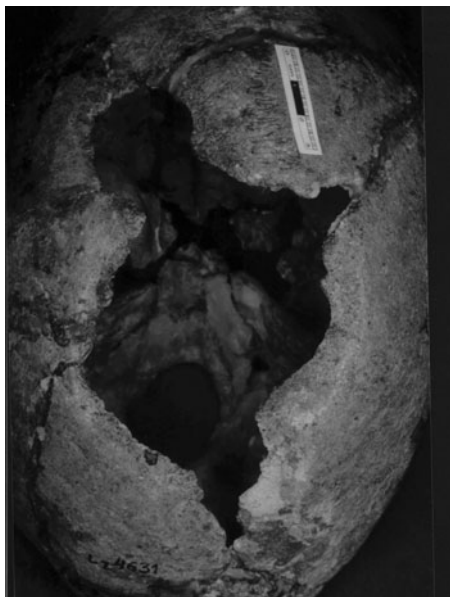


Figure 3.7. Zvejnieki grave 227, Late Neolithic, male, 40–45 years. Three large overlapping apertures on the skull vault – healed trephinations.

caused competition for resources) that took place in the Late Bronze Age in this region, such systemic antagonism between communities reflected in these mortal lesions seems to be a plausible explanation.

CONCLUSIONS

Throughout the Stone Age in the eastern Baltic, the majority of traumas can be considered as ‘casual’, resulting from everyday life events, but not from intra- or intergroup violence or warfare. The pattern of traumas demonstrate clear gender differences in physical activities: males were experiencing much more physically demanding lives. Dental wear patterns and dental trauma indicate the intensive use of teeth as a tool. Five cases of circumscribed inflammatory lesions on skull vaults and a case of healed trephination concerning five mature adult males could be a reflection of complex social hierarchy and related rituals in ‘delayed return’ communities. Sophi-

sticated burial customs themselves are in concert with this speculation based on skeletal finds. Such an absence of significant secular trends may be suggestive of very slight and gradual changes in subsistence in general and social stability, as well as failure to correspond to the 'classical' Neolithization model. The situation perhaps changes in the Late Bronze Age, when we hypothesize that shifts in climate, the advent of new technologies, and changes in subsistence (the period sees the final transition to agriculture) could trigger more systemic violence, not excluding antagonisms on the advancing agricultural frontier.

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Skeletal trauma and violence among the early farmers of the North European Plain: evidence from Neolithic settlements of the Lengyel Culture in Kuyavia, north-central Poland

Wiesław Lorkiewicz

ABSTRACT

A total of 109 Early Neolithic skeletons representing the populations of the Brześć Kujawski Group of the Lengyel Culture from Kuyavia in central Poland were studied in terms of the presence of intentional skeletal trauma that could indicate interpersonal violence. The skeletal series comes from seven settlements: two central in Brześć Kujawski and Osłonki, and five satellites in Konary (two), Miechów (two), and Pikutkowo (one), which existed concurrently between 4600 and 4000 BC. In total, 31 traumatic lesions were found in 18 individuals. Of these, 19 injuries found in 14 individuals may be regarded (with a varying degree of probability) as resulting from interpersonal aggression. Lesions classified as intentional trauma occur more often in men than in women (9:4), and this prevalence is even more pronounced in the case of injuries of the cranium inflicted with implements (8:2). The latter have a rather haphazard pattern in terms of their location on the skull, which indicates that many of them did not arise from 'face to face' confrontation. All the settlements reveal traces of partial destruction and fires, which are associated with a local conflict that took place halfway into the period

of their existence. As a result, in the Ośłonki settlement some fortifications were built, that is, a ditched enclosure and a palisade with a gate. The type of injuries observed on skulls of victims of a probable attack on Ośłonki (a triple grave of a woman and children) indicates the use of antler battle axes—a typical weapon in that culture. This discovery points to a conflict between populations representing the same culture, as it resembles evidence for this type of conflict described for the Linear Pottery Culture (or Linearbandkeramik) culture based on finds in Talheim and Asparn-Schletz. Furthermore, a male burial from the late phase of the settlement in Ośłonki, during its decline, reveals probable signs of an atypical burial rite, displaying numerous cut marks in the cranium and having had both shins broken.

INTRODUCTION

The Neolithic period in the area of present-day Poland lasted from 5500 to 2300 BC. Its beginnings were associated with the appearance of groups of farmers from the Linear Pottery Culture (or Linearbandkeramik; LBK) (most evidence favours colonization as the mechanism of Neolithization of this part of Europe (e.g. Bogucki 2000)). A close relationship with the south is characteristic of the whole Polish Early Neolithic period, which is for this reason described as Danubian. In the Middle Neolithic, from 4000 to 3000 BC, apart from the still existing Danubian cultures, the first indigenous Neolithic culture of the North European Plain—the Funnel Beaker Culture—came into being. The Late Neolithic (up to 2300 BC) saw the rise of the Globular Amphorae Culture, Corded Ware Culture, and, locally, the pan-European Bell Beaker Culture.

The first Neolithic farmers that came to the area of present-day Poland settled, not only in the loess highlands in the south, but also penetrated the fertile black earth soils in the north-central lowlands, thus initiating the Neolithization of the North European Plain. One of the main areas of Early Neolithic settlement became Kuyavia, situated in central Poland. Approximately a thousand years later, a local culture group arose termed the Brześć Kujawski Group of the Lengyel Culture; this was a result of subsequent migrations and influences from the south and west, and perhaps due to the evolution of

agricultural populations coming from the first LBK settlement waves. It is an example of the adaptation of Linear Pottery populations to the natural conditions of the lowlands, which is revealed, for example, in the increased role of domestic animals, including cattle. This cultural unit is well-described thanks to studies of large settlements in Brześć Kujawski (the eponymous site) and in Osłonki conducted by the Archeological and Ethnographic Museum in Łódź (Jażdżewski 1938; Grygiel and Bogucki 1981, 1986, 1997; Bogucki and Grygiel 1993; Grygiel 2008). Kuyavia, which was an area where the Danubian populations and autochthonous hunting–gathering populations came into contact, also played a key part in the middle period of the Polish Neolithic, as it was one of the places where the indigenous Neolithic culture of the European Plain, or the Funnel Beaker Culture, came into being.

THE SITES

The skeletal material studied in this work mostly comes from two settlements (i.e. Brześć Kujawski and Osłonki), which was uncovered and examined on a large scale, encompassing 70–80% of the area. These settlements, situated about 8 km apart east to west, are both dated to approximately 4600–4000 BC and probably existed concurrently and thus may have been in contact with each other (Figure 4.1). The Brześć Kujawski site was discovered in 1933 and was studied for six consecutive seasons up to the outbreak of World War II. Excavations resumed in the 1970s and 1980s. Particularly valuable information was provided by excavations conducted from 1989 to 1994 in the Osłonki settlement, which definitely had a defensive character. It was situated in such a way that it was protected on three sides by marshes. Furthermore, halfway into the existence of the settlement, on the side not thus protected, a defensive structure was built, namely, a ditched enclosure and palisade with a gate (Grygiel and Bogucki 1997). It is the only known Neolithic system of fortifications discovered so far on the Polish Plain, and is related to Kreisgrabenanlagen-type arrangements built at the time in the south and west of Europe (Grygiel 2008). According to archaeologists, the creation of these fortifications is associated with an attack identified by the remains of burnt trapezoidal houses (lumps of fired clay daub from the walls), abandoned

belongings of the inhabitants, evidence of a sudden interruption in the functioning of a large part of the settlement, and a partially fired arrowhead among the rubble. Some graves are interpreted as burials of the victims of this event due to their locations in the immediate vicinity of the burnt houses. One of them, the triple grave of a woman and children, is described in this work.

The most characteristic feature of the settlement pattern in the Brześć Kujawski group is its large trapezoidal houses, which were up to 40 m long and 5 m wide. It is thought that the settlement consisted of up to 10 such houses existing concurrently (in Brześć over 50 houses were discovered, and in Oślonki about 30), which could have been inhabited by about five to seven people each. Probably, the living quarters were located only in the southern part of the house while the remaining area served as a barn or as a storage area (Grygiel 1986). Graves were located within the settlement, often in small cemeteries in the immediate vicinity of the houses, which implies family relationships between the dead. The skeletons were placed in the contracted position, males on their right side and females on their left side. A typical inventory of male burials includes (but not always) T-axes made from deer antlers and/or bone dagger points. In one male burial 11 massive bone arrowheads were found, which were arranged in a manner suggesting the presence of a quiver. These 'warrior' graves account for 37.1% of all unearthed male burials from sites mentioned above and are more common in Brześć Kujawski (50.0%) than in Oślonki (31.6%).

These rules of the mortuary rite in relation to position of the body and occurrence of the grave goods were not so strictly abided by towards the end of this culture.

THE SKELETAL SERIES

In Brześć Kujawski, 82 graves were discovered and 52 skeletons available for study (some skeletons from the earliest period of excavations were lost), including two belonging to the LBK. For the most part, this material has not been so far subject to comprehensive analysis of bone lesions. In Oślonki, 84 graves were discovered with the remains of 93 individuals (several graves contained double burials, with one triple burial). Some of the skeletons with lesions

Table 4.1. Distribution of analysed specimens according to age, sex, and burial discovery site

Sex	Age class*								
	inf.I	inf.II	inf.II/juv.	juv.	juv/ad.	ad.	ad./mt.	mt.	sn.
Males	–	–	–	–	2(BK) 1 (K)	15 (O) 11 (BK)	3 (O)	6 (O) 3 (BK) 2 (K)	2 (O)
Females	–	–	–	2 (O)	2 (O)	12 (O) 10 (BK) 3 (K) 2 (M) 1 (P)	1 (BK) 1 (K)	3 (O) 3 (BK)	–
Undetermined	3 (O) 1 (BK) 1 (P)	4 (O) 4 (BK) 1 (K)	1 (BK)	5 (O) 2 (BK) 1 (K) 1 (M)	–	–	–	–	–

*Age class ranges according to Szilvássy (1988): infans I, 0–7; infans II, 7–14; juvenis, 15–20; adultus, 20–40; maturus, 40–60; senilis, over 60.

O, Osłonki; BK, Brześć Kujawski; K, Konary; M, Miechowice; P, Pikutkowo.

from this site are described by Garłowska (2001). Furthermore, 26 skeletons come from five small satellite settlements, Konary (two), Miechowice (two), and Pikutkowo (one), which constituted economic subsidiaries to the central communities of Osłonki and Brześć Kujawski. Finally, after rejecting particularly poorly preserved individuals, without the possibility of a reliable assessment of potential bone lesions, 109 skeletons were selected for analysis: 45 males, 40 females, and 24 immature individuals (Table 4.1). The mean age at death of adults in the whole population from which the sample was selected was 35.8 ($n = 57$) for men and 33.2 ($n = 53$) for women.

All the skeletons were examined macroscopically, and in several cases, radiographs were taken in order to study the lesions in greater detail. Research was conducted by the author, an anthropologist with substantial experience in examining bone lesions after extensive cooperation with forensic doctors.

ANALYSED TRAUMATIC LESIONS

The range of pathological conditions considered by various authors as traumatic lesions is very broad, including some degenerative

lesions (i.e. exostoses), Schmorl's nodes (Knowles 1983), or development disturbances such as arrested growth lines (Steinbock 1976). This work focuses on conditions that might be associated with interpersonal conflict both unequivocally (possible weapon wounds to the cranium) and with a certain degree of probability (some fractures in the maxillofacial region, or 'parry fractures' of the ulna). According to the categorization of traumatic injuries presented by, for example, Knowles (1983) and Ortner and Putschar (1981), the analysed lesions should be classified as fractures and weapon wounds, while according to the categorization by Roberts and Manchester (1995) and Lovell (1997), they would be classed as fractures.

More difficulties in diagnosis were generally encountered in the postcranial skeletons due to post-mortem erosional damage from the burial environment. Thus, possible peri-mortem bone lesions became poorly visible. Consequently, identification focused primarily on ante-mortem bone fractures, usually well healed, which left visible changes in bone morphology resulting from the inflammatory process or misalignment of bone parts. Of these, only a parry fracture of the ulna was diagnosed as probable evidence of interpersonal aggression. In the case of skulls, observations were made mostly on the crania, which probably misrepresent to a much lesser degree the picture of traumatic lesions in the studied population, given the fact that head injuries caused by direct trauma usually affect the vault (Lovell 1997). Such problems with assessing the frequency and types of injuries in a living population based on skeletal records are described at length by numerous authors (e.g. Aufderheide and Rodríguez-Martin 1998; Schulting and Wysocki 2005; Roksandic *et al.* 2006).

RESULTS

Table 4.2 presents a summary of all observed traumatic lesions in the studied skeletal series. The majority of them were classified with a varying degree of probability as examples of intentional trauma. Several cases are discussed in detail below.

The majority of examples of lesions were found in skeletons from Oślonki. A very interesting find, in terms of both bone defects and archaeological context, is burial no. 30. It comes from a late period in

Table 4.2. All recorded instances of trauma in analysed skeletal material

Site/grave number	Sex	Age (years)	Observed trauma
A. Instances possibly caused by violence			
Oślonki/23	Male	20–30	Small healed fracture to the right supraorbital arch (10 × 11 mm)
Oślonki/27	Male	50–60	Healed depressed fracture to the top of the cranium, on the midline (17 × 23 mm)
Oślonki/30	Male	30–40	Probable peri-mortem fracture to the frontal bone
Oślonki/33	Male	35–45	(1) Healed depressed fracture to the left parietal bone (18 × 24 mm); (2) healed fracture of the right ulna ('parry fracture')
Oślonki/34	Male	40–45	Ante-mortem loss of three anterior teeth (probably knocked out); both lower right incisors and upper left first incisor
Oślonki/35	Male	25–35	Healed depressed fracture to the frontal squama (on the midline) (12 × 19 mm)
Oślonki/60	Male	30–40	(1) Healed, massive crush fracture in the left parieto-occipital region; (2) healed fracture of the nasal bones
Oślonki/63	Male	25–30	Four unhealed injuries to the cranium
Oślonki/73	Female	25–35	Peri-mortem circular injury to the right parietal bone
Oślonki/73	Undetermined (archaeologically male)	9–10	Peri-mortem circular injury to the left parietal bone
Oślonki/76	Male	20–30	Healed fracture to the left frontal bone (20 × 5 mm)
B.K.4*/14	Female	30–40	Healed massive fracture to the left occipital bone
B.K.4*/79	Female	30–40	Healed fracture of the right condylar process of the mandible
Konary 1/10	Female	35–45	Healed fracture of the nasal bones
B. Others			
Oślonki/23	Male	20–30	Healed fracture of the left clavicle
Oślonki/30	Male	30–40	(1) About 20–25 peri-mortem cutmarks on the left parietal, temporal, and occipital bones; (2) peri-mortem fracture of both shanks
Oślonki/63	Male	25–30	(1) Healed unreduced fracture of the left humerus; (2) healed fracture of the right radius (Colles' fracture)
B.K.4*/7	Female	Maturus	Healed fracture of the fifth finger (left hand)
B.K.4*/15	Female	35–40	Probably post-traumatic alteration of the great trochanter of the left femur
B.K.4*/34	Male	30–40	Healed rib fracture
Konary 1/1	Male	~50	Healed fracture of the right humerus and rib

*B.K.4, Brześć Kujawski, Site 4.

the existence of the settlement and is an example of an atypical burial not adhering to one of the basic rules of the burial rite, namely, position of the body (the skeleton was placed on its back). The individual buried in this grave had both shins broken: the left one about one-third of the length from the distal end, and the right two times, about one-quarter of the length from both ends of the bones. Both the arrangement of limb bones in the grave (the completely preserved anatomical order of the bones of the feet and the distal ends of the shins) and characteristics of the fractures indicate that the injury occurred *peri-mortem*. The fractures of the left and right tibiae near the proximal ends are comminuted fractures of the butterfly type caused by direct trauma. The form of the fragments indicates that bone fracture was caused by an impact inflicted from behind. Both fibulae are also extensively fragmented because of the *peri-mortem* trauma as well as *post-mortem* damages. The poor condition of the upper limb bones makes it impossible to determine whether fractures and displacement of the pieces of left humerus also occurred at the same time. Furthermore, some injuries were observed in the skull of this individual. In the frontal squama, approximately 2.5 cm above the glabella, there is a large defect, whose irregular shape and lack of some of the marks of *peri-mortem* cranial trauma (e.g. internal bevelling along the whole edge) could suggest a *post-mortem* impact. However, linear fractures radiating out from the defect and signs of damage to the outer table at one of the edges seem to corroborate the thesis that injury occurred *peri-mortem* on 'fresh' bone. Apart from this lesion, on the left parietal bone and adjacent occipital squama and mastoid part of the left temporal bone there are about 20–25 shallow cut marks of varying lengths (the longest is 55 mm long), which are generally parallel and run from the parietal eminence to the occipital bone and cross at right angles to the left half of the lambdoid suture (Figure 4.2). Substantial evidence unequivocally shows their *peri-mortem* character. Most of the cut marks consist of two (or sometimes three) striae, which implies that they were probably made with a flint blade whose cutting edge had several facets created in the process of its production (Greenfield 1999). Detailed examination did not reveal any additional cut marks in other parts of the skull or postcranial skeleton.

It is hard to interpret this burial unequivocally. Is it a case of an interpersonal conflict or a trace of a burial rite resulting from the special status of the buried person (or both)? However, one may not



Figure 4.1. Map of Poland with the Kujavia region (the dotted line) and location of analysed sites marked.

rule out that some of the injuries arose because of some unfortunate event that led to the individual's death. It needs to be stressed that apart from the atypical arrangement of the dead body (which may be associated with general changes in the burial rites at the end of the cultural unit) this burial was equipped with rich grave goods. Therefore, it seems unlikely that it was the grave of a socially rejected person, stigmatized by mutilation of the cadaver.

The burial of the male from grave no. 60 provides an example of a large, well-healed skull injury. On the left parietal bone, in the area of the mastoid angle and adjacent part of the occipital squama, there is a large circular bone depression, 54 mm in diameter, resulting from a comminuted fracture due to blunt force trauma (Figure 4.3). The injury was completely healed with poorly visible fracture lines (only in the front part of the defect there is a marked trace of a concentric fracture). The regular shape of the depression suggests that the blow was inflicted by a ball-shaped object. Of the inventory of objects found in the discussed settlements, the ones that most closely correspond to the shape of the injury are stone pestles and stone grinders. However, these objects were never found in a context suggesting they were ever used other than as household tools (as parts of clubs for instance), which does not preclude their occasional use as weapons.

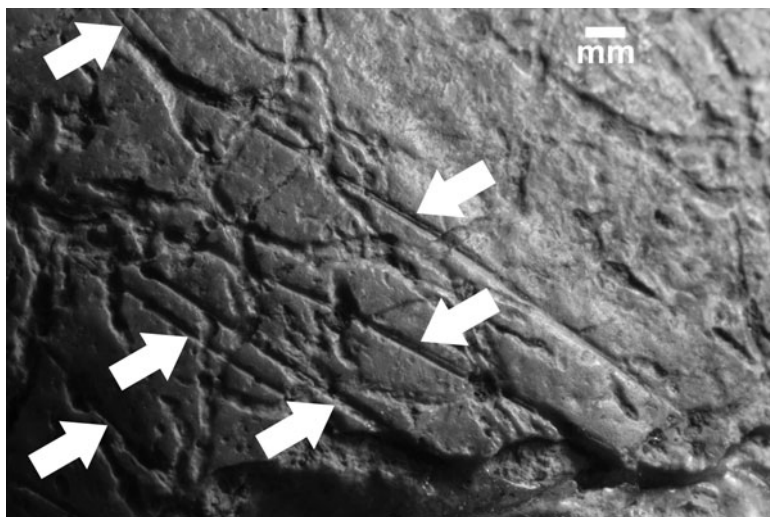


Figure 4.2. Osłonki, grave 30. Close-up of the cut marks on the left parietal bone.

The individual also had a healed fracture of the nasal bones that was probably caused during the same event.

In the two graves from Osłonki, peri-mortem skull injuries were identified, which could be considered to have caused the death of the buried individuals. In grave no. 63, there was the skeleton of a young man aged about 25–30. The postcranial skeleton of this individual had traces of two completely healed ante-mortem injuries: fractures of the left humerus below the surgical neck and the distal end of the right radius (Colles' fracture). In both cases, the healing of the fractures caused a significant shortening of the bone. Furthermore, humerus fracture led to degenerative changes as well as deformation of some parts of the humeral joint (e.g. marked asymmetry of the acromia). This suggests that the injury happened long before death of the individual and led to significantly reduced mobility of the joint. In this case, fractures of the postcranial bones should be classified as accidental trauma. Besides these, the skull revealed traces of peri-mortem weapon wounds. Three of them (Figures 4.4 and 4.5) take the form of complete perforations of the cranial vault and are located on both parietal bones: one in the area of the parietal eminence (perforation 12×20 mm), and the other two on the left and



Figure 4.3. Oślonki, grave 60. Healed, massive crush fracture in the left parieto-occipital region.

right sides of the *pars obelica* of the sagittal suture (16×15 mm and 13×16 mm), respectively. In particular, properties of the defect in the centre of the left parietal bone (Figure 4.6), such as bevelling of the inner table of the vault, a concentric fracture on the edge of the injury, and linear fractures radiating out from the impact site, correspond to the criteria for peri-mortem cranial trauma (e.g. Schulting and Wysocki 2005). The less pronounced stellate fractures in the case of holes located near the median plane of the skull might be a consequence of the dispersion of some of the impact energy on the non-obiterated sagittal suture. The similar sizes and shapes of all three defects indicate they were made with the use of the same sharp-pointed implement. Furthermore, the regular semicircular defect in the upper part of the occipital squama in the area of the left half of the lambdoid suture with some signs of internal bevel might suggest a fourth injury of a markedly larger diameter of about 33 mm, caused by use of another object, also penetrating the skull wall. Additional evidence for considering the above-mentioned defects as peri-mortem trauma is a very good degree of preservation of the skull bone and the same patination of fracture surfaces and adjacent bone.

Among all the injuries observed in the analysed material, only the cranial vault wounds of this individual may be linked to the use of projectile points, considering their shape and diameter. In particular, they correspond to bone arrowheads found in one of the male burials



Figure 4.4. Osłonki, grave 63. Three unhealed injuries to the cranium.

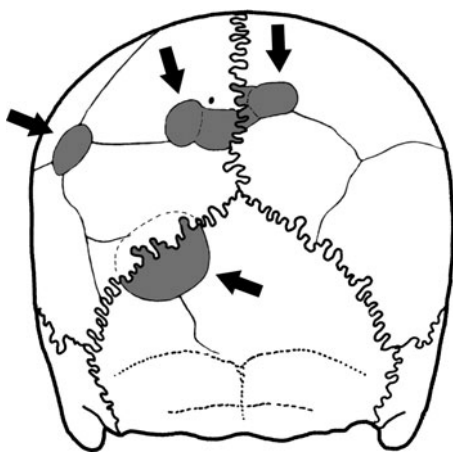


Figure 4.5. Osłonki, grave 63. Drawing illustrating location of the injuries and radiating fractures.

in Osłonki resembling medieval crossbow bolts. On the other hand, the location and repeatability of these defects seem to weigh against use of such a weapon. It is hard to imagine a situation in which three rather untypical bow arrow hits could have taken place, especially considering that the first one would have been already lethal. Apart from the described burial, the identified projectile points are not a

common find in the Brześć Kujawski group, although some of the commonly found small bone blades could have served this purpose. Only one case of projectile points among the 26 weapon-equipped male burials suggests that bows were not in common use in this society.

Grave 73 in Osłonki contained the remains of three individuals: a woman about 30 years of age and two children aged about 4–6 and 9–10. It is associated with traces of the destruction of part of the settlement interpreted as the aftermath of an attack that led to construction of the fortifications. According to archaeologists who conducted excavation, grave no. 73 is one of the burials that might have contained remains of the victims of this event (Grygiel 2008). The skulls of the woman and older child show very similar lesions characteristic of peri-mortem trauma (Figures 4.7–4.10). In both cases, they are located on the parietal bones, the left one in the child and the right one in the woman, and have a diameter of 44 and 45 mm, respectively. The shape of the holes suggests that the presumed injuries were made with the same implement, perhaps an antler-beam mattock. They certainly could have caused the death of both individuals, given the lack of any signs of healing, their extent, and penetration of the cranial cavity. It should be mentioned here that among the animal remains discovered at the Osłonki site, a goat skull was found with the same type of hole in terms of shape and size,

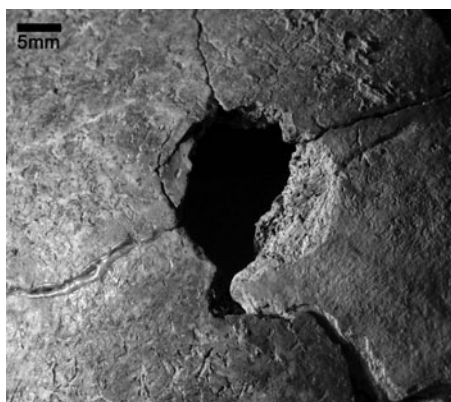


Figure 4.6. Osłonki, grave 63. Close-up of the injury to the left parietal bone with concentric fracture on the left side of the defect (opposite recent damage with lack of patina is visible).

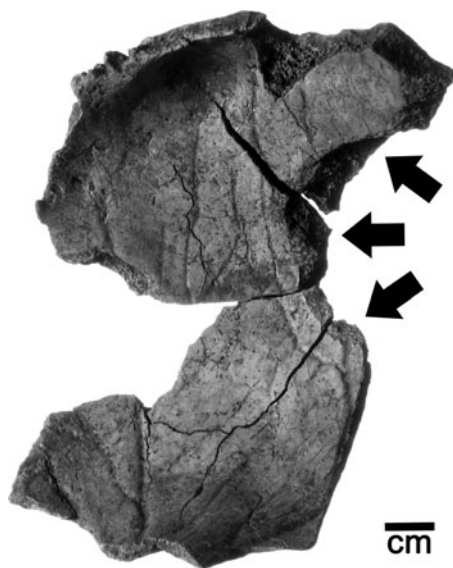


Figure 4.7. Osłonki, grave 73 (female burial). Probable peri-mortem injury to the cranium: interior view of a round defect in the right parietal bone.

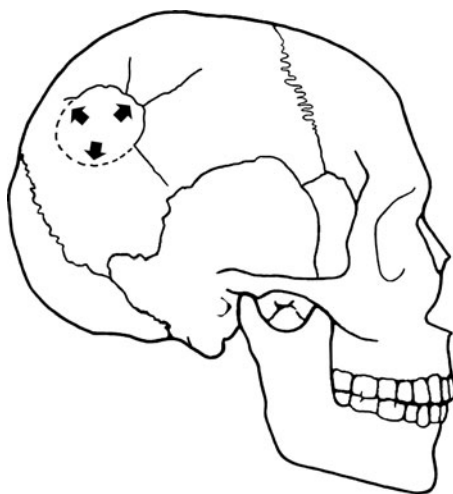


Figure 4.8. Osłonki, grave 73 (female burial). Drawing illustrating location of the probable injury on the cranium.

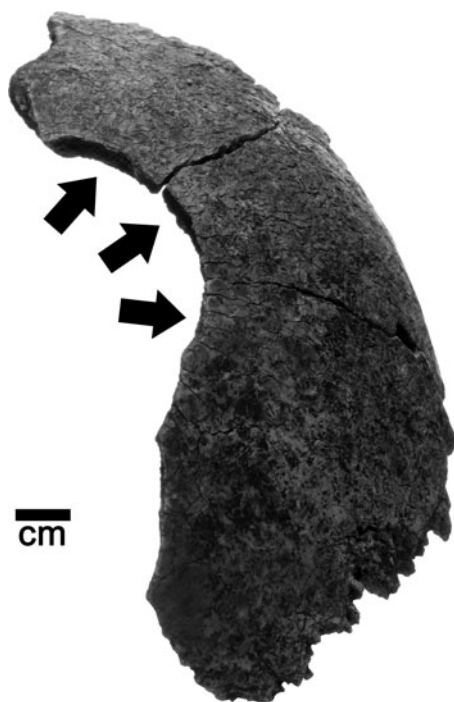


Figure 4.9. Osłonki, grave 73 (child burial). Probable peri-mortem injury to the cranium: a round defect in the left parietal bone.

resulting from an impact inflicted with an implement with a circular cross-section, most probably a mattock of this type (Bogucki 2008).

Apart from the cases described above, smaller and completely healed skull injuries were also found in five males from the Osłonki settlements (Figures 4.11–4.13). All of them are depressed fractures located on the frontal or parietal bone. In two males, completely healed upper limb fractures were additionally observed, including the left clavicle (grave no. 23), and right ulna approximately one-quarter of the shaft's length from the distal end (a 'parry fracture') (grave no. 33).

Injuries to the facial part of the skull were observed definitely less frequently. Apart from the above-mentioned nasal bone fracture, there is only the ante-mortem loss of three front teeth in the mandible (right first and second incisor) and maxilla (left first incisor) in the

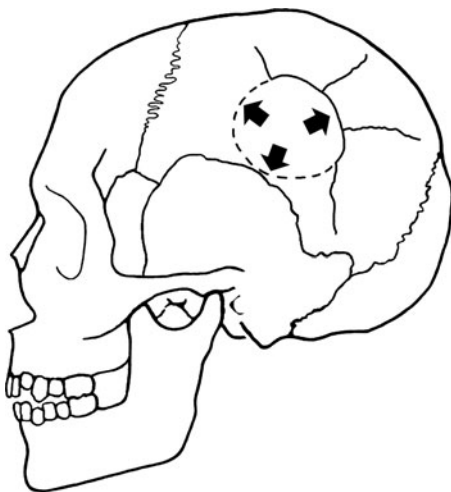


Figure 4.10. Oślonki, grave 73 (child burial). Drawing illustrating location of the probable injury on the cranium.



Figure 4.11. Oślonki, grave 27. Healed depressed fracture to top of the cranium.

male from grave no. 34. The displacement of the adjacent teeth towards the gap in the dental arch and advanced changes in the alveolar process indicate that teeth were lost long before the death of the individual. In comparison with the unequivocal skull fractures due to the use of weapons, such an injury constitutes a not very

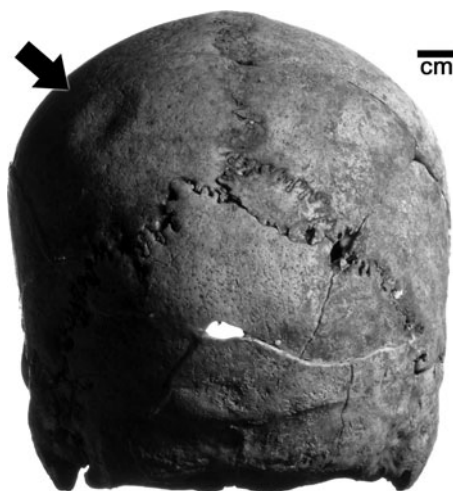


Figure 4.12. Oślonki, grave 33. Healed depressed fracture to the left parietal bone.

specific example of interpersonal violence and might have resulted from accidental trauma.

The other sites did not provide any examples of bone defects that could be linked to the use of weapons. An exception here is a female skeleton from grave no. 14 discovered in the Brześć Kujawski settlement. The skull, in the area of the occipital squama, reveals a healed fracture, which was already identified during the excavation (Jażdżewski 1938), and then described again by Kapica (1970). Unfortunately, it was not possible to find this skull in the process of collecting Neolithic material for this work, and the only evidence available is rather poor quality pictures. The shape and size of the injury indicate that it might have been caused by the impact of the blunt side of an antler-beam mattock. Among the other injuries, intentional trauma might be associated with the healed nasal bone fracture (a woman from site no. 1 in Konary) and possibly a healed fracture of the right condylar process of the mandible (a woman from site no. 4 in Brześć Kujawski). On the other hand, accidental bone fractures were observed more often in the other sites, as compared with Oślonki. Furthermore, in contrast to intentional trauma observed mostly in men, they occurred equally often in both sexes.

DISCUSSION

Altogether, of the 109 examined skeletons 18 revealed a total of 31 trauma-related bone fractures and defects (including cut marks on the male skull from grave no. 30 in Osłonki). Of these, injuries observed in 14 individuals may be considered, with varying degrees of probability, as resulting from intentional action and thus indicating interpersonal violence in the studied populations. The most reliable specimens, both in terms of correct palaeopathological diagnosis (identification of lesions and distinguishing them from post-mortem changes) and as potential evidence of violent behaviour, include the healed skull injuries in seven individuals (i.e. six males and one female). Three identified cases of peri-mortem injuries (grave nos 63 and 73 from Osłonki) can also be diagnosed with a high degree of certainty. Apart from the well-defined forensic criteria for the identification of peri-mortem cranial trauma, interpretation of these injuries is corroborated by archaeological data.

On the other hand, circumstances and reasons for the injuries observed in the male skeleton from grave no. 30 in Osłonki remain only a matter of speculation. The burial itself most probably reflects some funerary rite. However, it is impossible to decide whether the skeletal injuries were part of the rite and were inflicted on the dead body, or whether the individual was killed in this way, or perhaps they caused death of the individual because of some extraordinary event



Figure 4.13. Osłonki, grave 76. Small healed fracture to the left side of the frontal bone.

that led to the deceased man being treated in an exceptional way. It is also difficult to explain conclusively the purpose of the numerous cuts in the left part of the cranium in the parietal–occipital region. The literature mentions similar injuries on the skull surface linked to scalping or cutting off muscles in cannibalism or funerary practices (e.g. Merbs 1989; Olsen and Shipman 1994; Ubelaker 1996; Beyneix 2008). An example of a Neolithic skull from Europe (Sweden) with cuts arranged in a way that is typical of scalping is described by Düring and Nilsson (1991). The pattern of these cut marks (their location and number) on the studied skull does not resemble other known cases, however, as the cuts would not be very effective from that point of view. The closest analogy is probably going to be found in skeletons from Germany and Britain. In the population inhabiting the Late LBK site at Herxheim (southwest Germany), scalping through making incisions along the sagittal planes of the calottes was part of the rites concerning the dead (Orschiedt *et al.* 2003). A very similar location of cuts made with stone implements in two Neolithic skulls was described by Schulting and Wysocki (2005). In one case, they are located on the rear part of the left parietal bone (this case is described by the authors as probable and requiring confirmation) while in the other they are located on the left temporal bone and are thought to be marks resulting from cutting off the ear as a trophy. Thus, the burial from grave no. 30 in Osłonki is treated in this work as a probable example of interpersonal violence only due to possible trauma of the frontal bone.

Injuries to the facial region were observed much less frequently: only on four individuals, as compared with 11 individuals with injuries to the cranium. It is hard to tell whether this situation arises due to the generally poor preservation of facial bones (only about one-quarter of the analysed skulls exhibit a sufficiently preserved infraorbital region), or whether it perhaps reflects the real pattern of head injuries in this population. Contemporary clinical data indicate that nasal bone fractures are frequent, albeit not very serious, injuries resulting from interpersonal aggression (Lovell 1997). According to Walker (1997), they are almost as widespread as injuries to the major bones of the cranial vault—the frontal and parietal bones. In addition, dental trauma is a frequent consequence of violent interpersonal combat in contemporary clinical research, but is rarely classified as such in palaeopathological studies (Jurmain 1999). The fundamental problem is differentiation between trauma-related tooth loss and

missing teeth resulting from other causes (i.e. dietary factors, nutritional deficiency diseases (scurvy), congenital absence, and cultural ablation) (Lukacs 2007). In the case in question, caries may be ruled out as a potential underlying cause, as in the studied population it did not affect the incisors. On the other hand, tooth loss occurred too early to have been caused by periodontal disease (which is corroborated by mesial movement of the adjacent teeth and complete obliteration of the alveoli), even though the individual revealed rather advanced alveolar resorption. Cultural ablation is usually characterized by a symmetrical absence of teeth (Tayles 1996), and moreover, in the studied population this habit was not practised as there are no other cases that would yield themselves to such an interpretation. Nor is the case in question an example of congenital absence of teeth, as such anomalies concern, in terms of front teeth, maxillary lateral incisors, or mandibular mesial incisors (Alt and Tülp 1998). Another factor that should be considered as a potential cause of ante-mortem loss of front teeth, owing to its substantial incidence in the studied population, is their use as tools. In several individuals, such activities led to tooth loss because of severe attrition and periapical lesions. However, it seems that this cause should also be excluded, as the other teeth do not reveal any traces of non-masticatory, occupational modifications. Thus, the most probable explanation of the observed missing teeth is injury to the jaw region. However, it is impossible to determine whether it was an intentional blow (an argument for such an interpretation would be the male sex of the individual, while against it—the location of the missing tooth on the right side), or an accidental event (e.g. a fall).

It is equally uncertain whether the fractured condylar process of the mandible of the female from grave no. 79 in Brześć Kujawski is indeed an instance of interpersonal aggression. Nowadays, fractures of the mandible are some of the most common fractures of the facial bones (Tanaka *et al.* 1994), while 29–53% of them are fractures of the condylar process (Kawai *et al.* 2005). The main causes are falls, traffic accidents, and violence. Nevertheless, although both maxillofacial injuries constitute only probable evidence of interpersonal aggression, they still may be considered as good a marker of such behaviour as the frequently quoted fractures of the forearm, including ‘parry fractures’ (Merbs 1989; Lovell 1997).

In the studied material, there is a strong relationship between the incidence of injuries regarded as intentional trauma and the sex of the

individual: of the 13 cases identified in mature individuals, nine were men. The predominance of males is even more pronounced (8:2) if one considers only those injuries to the cranium that were made with some implements, which also constitute the most reliable evidence. The more frequent incidence of skull fractures in males is a universal rule in human populations (Jurmain 1999). It might be the case that in the analysed population this phenomenon reflects the existence of a group of 'warriors' particularly involved in potential conflicts (e.g. responsible for defending the settlements), and thus running the highest risk of injury (Grygiel 2008). One of their more prominent attributes was the antler-beam mattock, found in 21.4% of male burials. The arrangement of upper limbs indicates that the dead were buried holding in their hands such axes mounted on a wooden shaft. One can argue that the axes did not fulfil merely a symbolic function as most of the observed skull injuries may have arisen because of their use.

The traumas thought to be intentional constitute the majority of all bone injuries observed in the studied population, both in terms of the number of individuals with injuries and number of injuries. Individuals with supposedly intentional injuries constitute 61% (11 individuals, excluding grave no. 30 in Oślonki and two cases of injuries to the masticatory system) to 78% (14 individuals—all cases presented in part A of Table 4.2) of all the individuals with bone defects. Furthermore, injuries thought to be intentional constitute 48.4% (only cases identified with a high degree of probability) to 61.3% (all injuries presented in part A of Table 4.2) of the injuries. However, it is not certain whether such a distribution of injuries reflects a high degree of interpersonal aggression in the studied population. It would rather seem that it is a consequence of the predominant examination of crania, which are particularly prone to this type of injuries, and a substantial underestimation of incidence of injuries in the postcranial skeletons. Another factor that should be considered here is the relatively low age at death of the individuals in this population, which decreases the probability of accidental trauma (e.g. due to age-related bone loss) (Larsen 1997).

The location of skull injuries is often interpreted as an indication of the circumstances of their creation. In the studied material, observed injuries resulting from the use of implements are evenly distributed on all sides of the skull: four are located on the frontal bone, three at the back in the occipital region, three on top of the cranium, and four

on the sides, on the parietal bones (Table 4.3). Of the injuries to the frontal region of the cranium, two are found on the midline, one on the right, and one on the left. Although these numbers are too small to constitute the basis of conclusive statistical analysis, one may identify some patterns. The location of injuries described above indicates that most arose in circumstances other than face-to-face confrontation. Serious, extensive injuries to the skull, including those without healing (altogether seven injuries in skulls from grave nos 60, 63, and 73 from Osłonki and 14 from Brześć), are located in the rear part of the cranium, on the occipital and parietal bones. The frontal bones revealed only small, completely healed injuries. An exception here is grave no. 30 from Osłonki with a probable extensive trauma to the frontal bone, but as already mentioned, it does not easily yield itself to interpretation.

The skeletons with injuries are not evenly spread on the examined area of the settlement. They mainly occur in the southwestern part of the settlement with burial nos 23, 27, 30, 33, 34, and 35. It is not possible to determine if this concentration was accidental or not. For instance, it should be considered that the burials could have been deposited at different points in time. This is certainly the case with

Table 4.3. Summary statistics of the observed skull trauma

(a) Number of affected individuals/number of injuries versus sex (cranium and maxillofacial region)

	Healed (individuals/injuries)	Unhealed (individuals/injuries)	Total (individuals/injuries)
Males	7/8	2/5	9/14
Females	3/3	1/1	4/4
Children	0/0	1/1	1/1

(b) Location of injuries versus sex (only cranium)

	Males	Females	Children
Front	4	0	0
Vault	3	0	0
Side	2	1	1
Rear	2	1	0

(c) Side location of injuries (only cranium)

	Right	Left	Midline
Front	1	1	2
Vault	0	0	3
Side	1	3	0
Rear	0	3	0

burials 35 and 30, dating to the early and late phase of the settlement, respectively (Grygiel 2008). This part of the settlement does not seem to have been particularly exposed to any external hazards, either.

Burials of individuals with injuries tend to be wealthier equipped than those without them. For example, in the case of male burials, weapons (T-axes and bone dagger points) occur in both types of burials with a frequency of 33.3% and 31.0%, respectively. On the other hand, no grave goods were found in 33.3% of burials of individuals exhibiting injuries, compared with 37.9% of those without signs of trauma. However, these differences are not statistically significant.

The difference in frequency of observed traumas between the two main settlements (i.e. Brześć Kujawski (5.6%) and Osłonki (23.9%)), does not seem to be of accidental character (chi-square value of 3.8 is close to statistical significance at $P < 0.05$). This cannot be explained by the different conditions of bone remains, which are actually better preserved in Brześć than in Osłonki. It is possible that the said armed conflict, signs of which appear in all sites in the region, largely affected the Osłonki settlement. Furthermore, this might have been the reason why such extensive fortifications were built there (although the lack of remains of such earthworks in Brześć Kujawski may be explained by damage to part of the settlement due to contemporary gravel mining).

There are ample data in the literature about the incidence of trauma in the Neolithic period, also in the context of evidence of violence and warfare (a review of northwestern Europe is given by Christensen (2004)). Schulting and Wysocki (2005), based on a large series of skulls from the British Neolithic, assessed the incidence of this type of injury to be 8.9%. A similar assessment for the Danish Neolithic was made by Bennike (1985, cited in Larsen 1997), who determined it to be 9.4%. These values are very close to the incidence of skull trauma found in the studied population—10.1% (11 individuals, cranial injuries only, excluding facial trauma) or 9.2% (additionally excluding grave no. 30 from Osłonki). Other works covering central European Neolithic populations from this period quote figures that are more varied. Bach (1978) identified only two cases of skull trauma among as many as 189 skeletons representing post-LBK from the Middle Elbe–Saale Region (4500–3300 BC). In turn, in the population inhabiting the settlement at Jelšovce in southwestern Slovakia, which belonged to the Ludanice Group of the Lengyel Culture and dated to 4300–4200 BC, almost 27% of individuals had

signs of skull trauma, mostly inflicted peri-mortem (Jakab 1995). A special type class of such finds is present evidence of the extermination of entire human groups. The best-known examples here are the mass grave in Talheim, in the Middle Rhine Valley, southwestern Germany (Wahl and König 1987; Wahl and Trautmann, see Chapter 5), and the skeletons discovered in the ditch system of the settlement in Asparn-Schletz, Lower Austria (Teschler-Nicola *et al.* 1996; Teschler-Nicola, see Chapter 6). Both sites are associated with the LBK culture. Among the 34 skeletons uncovered at Talheim, 18 had signs of lethal wounds to the skull. In the case of the Schletz skeletal material, all 33 skulls and skull fragments had lethal fractures. Similar discoveries are known from Vaihingen (Krause *et al.* 1998) in southern Germany (also associated with LBK), and from a fortified settlement of the Lengyel Culture at Ruzindol-Borová in western Slovakia (Vencl 1999). Such discoveries, apart from revealing the prevalence and severity of armed conflicts in the Neolithic, which is sometimes claimed to be a peaceful era, touch on the question of who the parties to these conflicts were. This problem is also raised in discussions concerning the function of Neolithic fortified settlements found in various parts of Europe. As the shape of injuries observed in skulls from Talheim and Schletz indicates the use of axes or adzes typical of the LBK, both of these sites are thought to be places of combat between Neolithic populations that belonged to the same culture. In turn, Golitko and Keeley (2007) interpret some of the cases of violence in LBK communities of central and western Germany as evidence of conflict with local hunter-gatherer groups. In the studied skeletal series, some of the injuries may also be associated with events broader than common within-group personal aggression. All sites reveal damage to houses and fires interpreted as signs of assaults on particular settlements. Consequently, fortifications were built in the central settlement in Osłonki and development of some of the satellite settlements was halted (Grygiel 2008). The type of lethal wounds observed in the skulls of two individuals from the burial associated with an assault on the Osłonki settlement imply use of an antler-beam mattock, typical of the Brześć Kujawski group of the Lengyel Culture. Similarly as in the case of Talheim and Schletz, it seems to point to a conflict between agricultural communities belonging to the same culture. The above-mentioned Jelšovce settlement in southwestern Slovakia, which also belonged to the Lengyel culture, shows that such events were not unusual at the time. Skeletons with injuries (very

similar to those described in this work), which were uncovered there were also considered to prove that some of the inhabitants were slain (Jakab 1995). However, are there any grounds for identifying the potential assailants as, for example, some autochthonous Mesolithic populations from Kuyavia? It seems highly unlikely. First, there is no evidence of the use of weapons uncharacteristic of agricultural populations. Furthermore, the process of Neolithization of Kuyavia probably led to an earlier disappearance of hunting-gathering groups in this area (e.g. through their assimilation by the LBK) (Czerniak 1994). Nevertheless, it needs to be stressed that the problem of relations between the allochthonous farming populations and autochthonous hunter-gatherers and, in particular, the time horizon of the existence of the latter, and their potential contribution to the creation of Middle Neolithic cultures, is still disputed.

CONCLUSIONS

In the studied series of 109 Neolithic skeletons representing the Early Neolithic population of the Lengyel culture from the area of present-day Poland, 31 trauma-related fractures and bone defects were identified in 18 individuals. Despite the obvious difficulties in drawing unequivocal conclusions about specific human behaviour based on observed bone defects (such problems generally concern any bioarchaeological research, including not only bone injuries, but also some pathological lesions and so-called markers of occupational stress), the overwhelming majority of injuries described above may be linked to interpersonal aggression with a high degree of probability. Another argument corroborating this thesis is the significantly greater incidence of injury in males, which, in the light of archaeological data (warrior attributes such as antler-beam mattocks found in graves) indicates an institutionalized form of violence in those populations. What are particularly interesting are injuries observed in burials linked to clear signs of devastation that affected all the settlements. They are in keeping with a number of discoveries in central Europe that show the relatively high incidence of conflicts in the Neolithic period in this part of the continent. These conflicts are usually described as wars (e.g. Christensen 2004; Golitko and Keeley 2007), although there are some opinions that their complexity does not

justify using this term. Beyneix (2007) expresses such an opinion in relation to conflicts among the early farming communities in western Europe. He lists some defining features of war, which full-fledged emergence is traditionally associated with the beginnings of the Bronze Age: specific armaments adapted to hand-to-hand fight, appearance of a military caste, and socialized character of the conflict and its direction against another group. It seems that all of these elements are identifiable in the archaeological and anthropological findings from the sites of the Brześć Kujawski group. Injuries on the skulls of two probable victims of such conflict from the Osłonki settlement suggest the use of weapons characteristic of the Brześć Kujawski group of the Lengyel Culture. Nevertheless, it is impossible to conclusively answer the question of who the assailants were (e.g. whether the conflict was local (Grygiel 2008) or perhaps part of a larger phenomenon similar to those from the final stage of the LBK (Teschler-Nicola *et al.* 1999).

The Neolithic massacre at Talheim: a pivotal find in conflict archaeology

Joachim Wahl and Iris Trautmann

ABSTRACT

The discovery in 1983/84 of the skeletal remains of 34 individuals from the Early Neolithic period in Talheim was considered significant among experts in many respects. For the first time in research history, we encountered evidence that questioned the accepted stereotypical picture of the peaceful farmer and it is still viewed today as the earliest proof of warfare by some prehistorians worldwide. It became clear that violent conflicts between larger population groups took place in central Europe towards the end of the Linear Pottery Culture about 7000 years ago. Although the actual motivation for confrontation in this particular case remains unclear, these findings provided important stimuli for the field of conflict archaeology, which is still active today. It was also possible, for the first time, to carry out detailed studies on a larger series of individuals on injuries and defects caused by blunt and (semi-)sharp force trauma from a Neolithic context. Besides reconstruction of the events that occurred at the turn of the sixth and fifth millennia BC, reconstruction of the internal structure of the Talheim population remains the focus of continuing investigations. Recent DNA analyses have shown that it may even be possible to decipher kinship structures within this demographically representative population.

INTRODUCTION

Talheim near Heilbronn was first mentioned in documents from the year 1230; it is a well-known wine-growing region and home to one of the most famous Neolithic find sites in southwestern Germany. A mass grave was discovered and excavated there during 1983 and 1984 (Wahl 1985, 2006), and was dated using conventional radiocarbon dating (5960 ± 80 BP, 5060–4670 cal BC, HD 8606–8827; 6045 ± 60 BP, 5250–4700 cal BC, HD 8607–8828) to a calibrated age of ca. 5000 BC (Wahl and König 1987, p.68). An additional seven bone samples from the Talheim skeletons, taken for AMS dating as part of a chronological comparison with the Linear Pottery Culture (or Linearbandkeramik; LBK) sites Asparn/Zaya-Schletz and Herxheim, confirmed the original estimated dates. The returned dates were between 5930 ± 35 BP, 4910–4710 cal BC, VERA-2021, and 6140 ± 40 BP, 5260–4940 cal BC, VERA-2047 (for details see Wild *et al.* 2004, table 2).

The find, therefore, belongs to a later phase of the LBK, whose trademarks include ceramic vessels decorated with scored bands filled with line patterns. Farming and animal husbandry, construction of large longhouses with their entrance facing towards the southwest, and production of ground stone axes are additional characteristics. Two different types of axes can be differentiated, the so-called flat axes with a long lentiform profile and the shoe-last adzes with a D-shaped profile, both with a slightly curved cutting edge. Both forms were shafted like an adze; the cutting edge was mounted horizontally on a so-called toe-haft and is very well suited for wood-working. They are also combined in the term ‘adze blades’.

At least nine different regional groups can be differentiated within the LBK of southwestern Germany (Strien 2000, 2007, p.7). They differ stylistically according to their preferred ceramic patterns as well as by dimensions of their axe blade profiles. Talheim belongs to the region group ‘Unterland/Kraichgau’, which includes ca. 360 settlements known to date. In combination with dendrochronological data from other LBK sites, these data result in an additional absolute chronological estimate dating the mass grave to ca. 5100/5090 BC (Strien 2007, p.9).

The people from this time period (e.g. from the nearby cemetery Stuttgart-Mühlhausen), had an average life expectancy between 20

and 25 years, were on average 1.57 m (women) and 1.66 m (men) tall (for specific values see Price *et al.* 2003, pp.29–32; for additional comparative data on life expectancy see, e.g. the cemetery from Schwetzingen: Francken and Wahl 2007). For the most part, they buried their dead in individual graves, lying on their sides with legs drawn into a crouched position, or alternatively in the form of cremations (Trautmann and Wahl 2005). In our region, they preferred to settle on the fertile loess sediments; the settlements were built on slight slopes to avoid waterlogging in houses and fields and had good access to rivers and streams to secure the water supply, to enrich the diet through fishing, and for transport. Fortified settlements are documented for the late phase of the LBK (in southwestern Germany, e.g. at Heilbronn-Neckargartach and Vaihingen/Enz, in Austria at Asparn/Zaya-Schletz) and can probably be attributed to an increase in population density and/or a scarcity of resources (see also Kerig 2003). Palaeoclimatic analyses also provide evidence for a warmer and drier climate than we are experiencing today.

THE SKELETON PIT AT TALHEIM

The Talheim mass grave was located less than 50 m southwest of an LBK settlement identified in the early 1930s during a field survey. The settlement itself has not been studied further to date. The location of the necropolis belonging to the settlement is not known. It is possible that it became a victim of erosion.

The grave pit measures about 3 m×1.5 m with a trough-shaped profile (Wahl and König 1987, 69f; Figure 5.1), the bottom edge reaching 0.6 m below today's surface. The skeletal remains of at least 34 people were found in the pit: men, women, and children from different age categories. The volume suggests an original pit depth of about 2 m, which corresponds well to the estimated amount of surface lost to erosion. The bone-bearing layer was about 20 cm thick in the central area, compressed to an average 10–12 cm depth. The skeletons most likely to have remained in anatomical connection were located near the bottom of the pit. Therefore, it was possible to completely reconstruct *in situ* the skeleton of the young woman 84/4 found in the lowest level, while only individual body parts remained in anatomical connection in the upper levels. The layers near the



Figure 5.1. The find layer in the middle portion of the skeleton pit, excavated in 1983. The concrete mounting for the greenhouse can be seen at the left and right border of the picture.

surface had been disturbed by farming activities and their contents were torn out of context and spread across the entire area over the past decades and centuries.

The lack of sediment layers between the bones shows that the bodies were not deposited successively into the pit, but that they were placed there during a single event. The orientation of the dead in the grave showed they were deposited without any noticeable order, in part with the extremities abducted in atypical directions, intertwined with one another, the upper bodies luxated at unnatural angles, often lying on the side or face down (Figure 5.2). The arms of

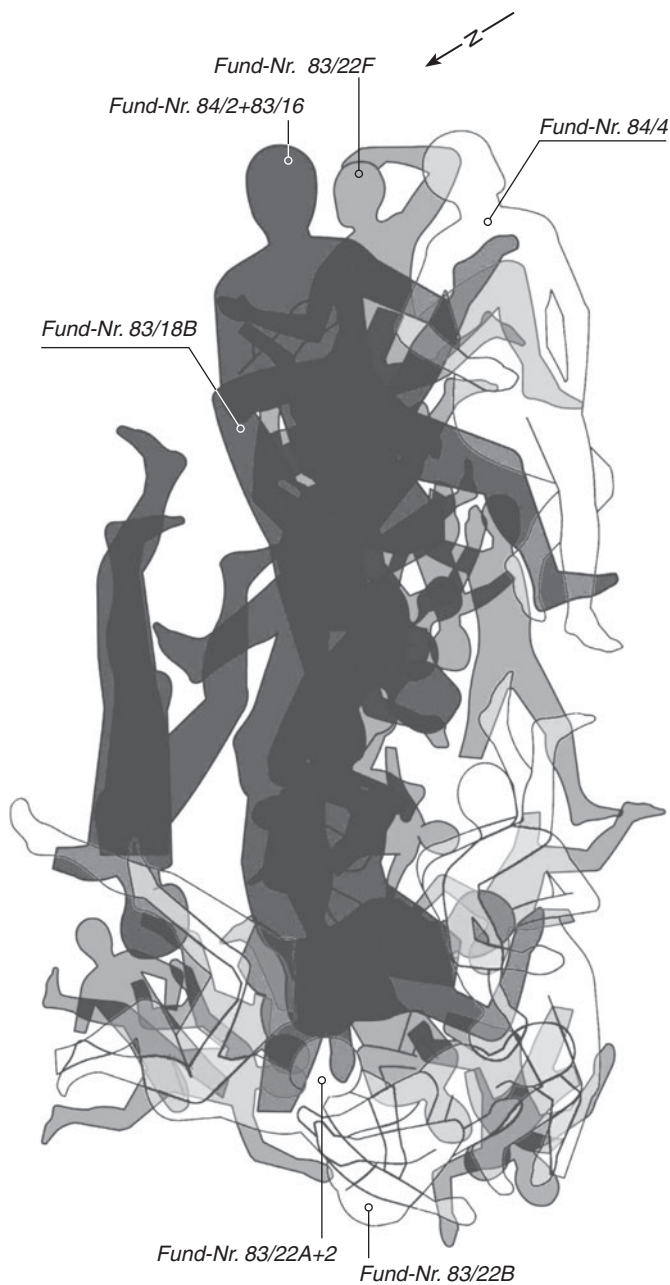


Figure 5.2. Reconstruction of the position of the bodies in the mass grave. Men are in dark grey, women white, and children and juveniles light grey.

the young woman 83/22A were stretched up and behind her, giving the impression that she may have been held by her hands and feet as she was thrown into the pit.

With respect to age distribution, subadult individuals include seven from the age category infans I (0–6 years), six from infans II (7–14 years), and three from juvenis (15–19 years) (Wahl and König 1987, pp.73–80). The 16 subadults (younger than 20 years) stand alongside 18 adults; the youngest child was about 2 years old, the oldest male about 60. The average age of the group was 23.3 years, which is consistent with the average life expectancy calculated for other skeletal series from the LBK in this region (see above). The proportion of males and females seems to be more or less balanced. Although neonates and unweaned infants up to an age of 2 years are missing, the demographic composition of the examined group of individuals could definitely represent the complete population of a small hamlet. The find documents a snapshot of a population that was—in the truest sense of the word—taken from life and cannot be compared with a typical cemetery population that accumulated successively over time and, due to the small number of individuals, does not necessarily characterize a demographically representative population at a given point in time. If neonates and young infants were present, then a maximum of four individuals from this age category might be missing—thereby taking into consideration the women of childbearing age and an accepted contraceptive breast-feeding period of about 2 years. However, these children could also have died due to an infectious sickness and may have been buried before the raid.

We did not identify any significant metrical, morphological, or typological differences to contemporaneous find sites in Baden-Württemberg (Wahl and König 1987, pp.84–94). The average stature at Talheim, calculated according to standard height estimation formulae defined by various authors (e.g. Trotter and Gleser 1952; Bach 1965), was 1.51–1.57 m for females, and 1.64–1.72 m for males. The pathological changes, moderate evidence for malnutrition (enamel hypoplasia, cribra orbitalia), degenerative changes, and comparatively little caries also correspond to the expected values. In contrast, it is worth noting that only a small percentage of adults (12.5%) show evidence of the so-called squatting facet, which is much more frequent in other LBK series from the region.

Evidence for violence

Prehistoric skeletal remains frequently show marks accrued before, during, or after burial of the body or bones and that provide evidence for pre-, peri- or post-mortem influences on the body. It is important to differentiate between the biomechanical characteristics of the human body and its components in living tissue and after long-term interments, as well as to recognize the different mechanisms that may influence the body in order to assess the various causes: in short, to differentiate between taphonomic and traumatic influences on the skeleton. Damage due to roots or animals, fractures caused by soil pressure, deformation, and brittle fractures can be observed alongside traces of fire, healed, or unhealed injuries caused by mechanical force, fractures, and other indicators that a bone was used as an artefact (e.g. Wahl and König 1987, p.122 and fig. 32d; Wahl and

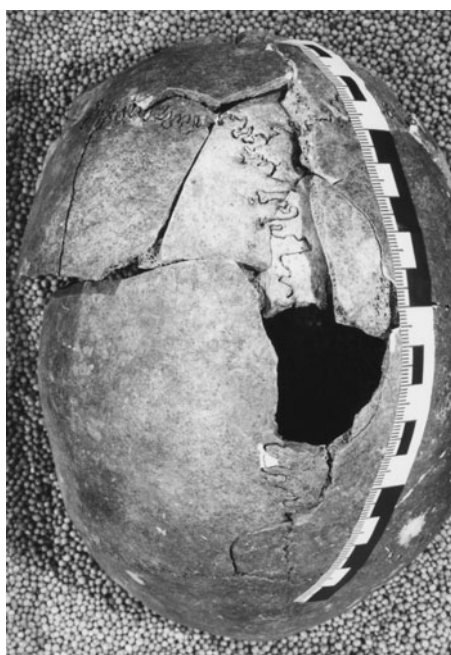


Figure 5.3. Cranial vault of the female juvenile 83/22 showing an incomplete hole fracture and a depressed fracture on the right parietal bone. Length of the depression: 45 mm.

Planck 1989; Wahl and Haidle 2003; König and Wahl 2006; Wahl 2007, fig. II.2.4; Schmidt and Symes 2008). In this context, older analyses have been re-evaluated and frequently found to be unconvincing or speculative (cf. Orschiedt 1999; Wahl *et al.* 2009). Therefore, the traumatic alterations observed in skeletal remains from Talheim were re-examined meticulously.

Twenty of the 34 identified individuals with more or less complete skulls, including two where the evidence is not entirely clear, exhibit unhealed traumas to the skull. Ten of these skulls exhibit multiple traumas (see Figure 5.3), among which five showed three or more defects. Individuals from all age groups were identified, from the youngest to the oldest individual and both sexes. Based on wound patterns, injuries can clearly be traced back to force trauma carried out with flat axes, shoe-last adzes, arrow points or tools with a blunt edge (club or the back end of a stone axe) that are typical for the time

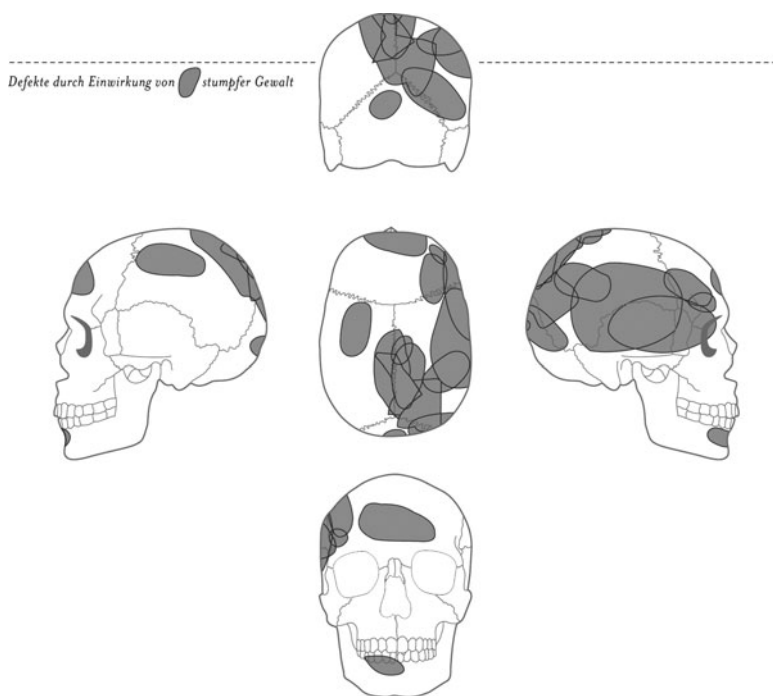


Figure 5.4. Schematic summary of all of the defects due to blunt force trauma on the Talheim skulls.

period. Traumas through the use of flat axes are the most frequent, followed by wounds due to unspecific blunt impact, shoe-last adzes, and arrows in a ratio of 22 : 14 : 4 : 2. Traces of multiple instrument impact on the same skull were identified in numerous instances. For example, the young man 83/12 was probably first knocked flat by an arrow to the neck and then killed by a blow with a stone axe.

In summary, the majority of defects were concentrated on the back and right side of the skull (Figure 5.4 cf. Wahl and König 1987, figs 47–50). The victims were attacked from behind by right-handed aggressors. Even some of the injuries to the forehead (e.g. the defect on the left os frontale of the young adult man 83/11) can be attributed to attacks carried out from behind. This constellation is made possible by the specific type of hafting of the utilized axes. The large accumulation of fractures on the 20–30-year-old man 83/12 can, after careful consideration, also be attributed to injuries carried out by a stone axe, hafted according to the tradition typical for the LBK. The angle of the toe shaft is ideal at about 70°; this angle was also observed in the pattern of injury (Figure 5.5). Therefore, in this specific case, the attack did not come straight on, it came with the broad edge of the axe from the right and above down on to the victim's head. The terraced breakage pattern occurred due to the involvement of the shaft, the hole located posteriorly shows where the stone blade impacted the skull.

It was possible to identify flat axes with different blade diameters with radii between 40 mm and 90 mm by using the contour of the skull defects. Hence, at least five to six different weapons of this type were used in the attack. In addition, we can assume involvement of an unknown number of attackers who used clubs or similar weapons as well as at least one individual who carried a shoe-last adze and at least one archer, so that the number of armed attackers was probably identical to or outnumbered the number of men among the victims in Talheim.

The location of the skull wounds and assumed angle of impact for the stone axes made it possible to reconstruct a victim–aggressor geometry in which the attackers were located behind the running, walking, or standing (possibly even sitting) victims. With regard to individuals with multiple traumas, it is probable that the primary blow hit the victim while in an upright position. The following blows were then aimed at the (unconscious) victim, lying on the ground. In addition, arrows aimed at the skulls of the men 83/8 and 83/12 hit them from behind (Figure 5.6).

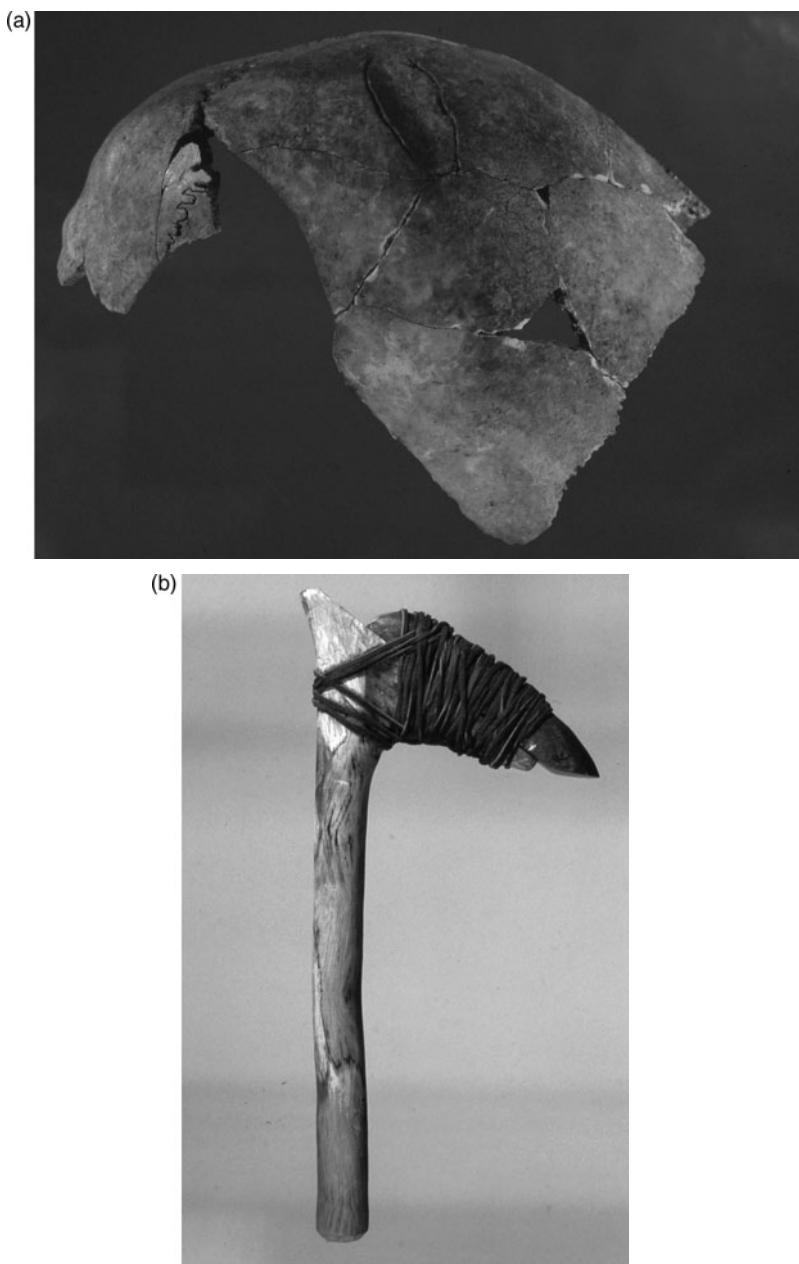


Figure 5.5. (a) Skull of the young adult male 83/12. (b) Reconstruction of a shafted shoe-last adze (reconstruction by Karin Sieber-Seitz). The complex of fractures shows that the stone axe must have hit the head with its broad edge.

Although defects to the skull clearly massed on the back of the head, it was possible to observe very diverse evidence. This fits well with the postulated sequence of events (see below), during which a certain amount of hectic, uncoordinated, spontaneous actions and confrontations can be expected. Therefore, the interpretation that people from Talheim may have kidnapped another group of LBK people, took them home, and then killed them during some sort of ritual (Narr 1993) seems less likely. Multiple traumas often inflicted using different weapons also argue against this interpretation. In case of a (probably methodologically standardized) sacrifice, execution, or ritual death, we would expect more regularity concerning the wounds and weapons used.

Only small pieces of skull were preserved for some individuals. We must also consider an unknown number of wounds to soft tissue, which do not necessarily leave any traces on bone. It is, therefore, very probable that all individuals from Talheim died a violent death. Special attention should be paid to the fact that only three definite and two possible wounds on the postcranial skeleton could be identified in the entire series (Wahl and König 1987, pp.166–169), all of them probably inflicted while the bone was still fresh and living. The perforation in a thoracic vertebra can in turn be attributed to an arrow shot at the victim from behind. Bending fractures on the humerus, ulna/radius, pelvis, and tibia have been attributed to blunt force trauma from different directions. Only the fracture of the two

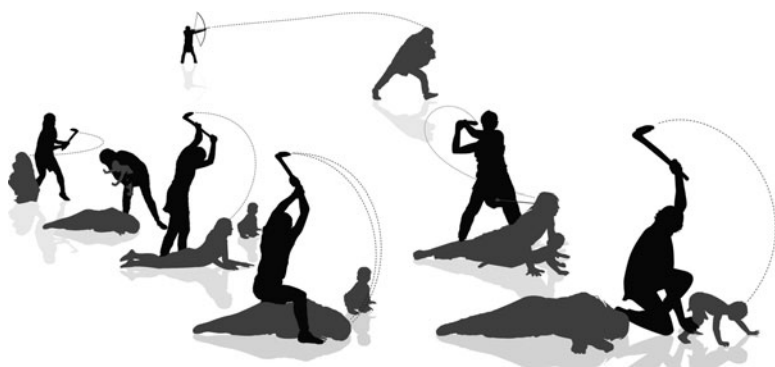


Figure 5.6. Reconstruction of a schematic interpretation of the events leading to the death of the man 83/12 and the boy 84/24.

lower arm bones could possibly be classified as defensive wounds. In sum, the distribution of identified defects do not speak for classic 'face to face' combat, from which we would expect lesions primarily on the face, arms, chest, and shoulders.

Additional results

Further important details are necessary to reconstruct the events at Talheim. One detail is the ceramic shards, which were scattered among the skeletal remains in the upper layers. The shards do not represent complete vessels, which could possibly have been interpreted as grave goods, but broken pieces from numerous vessels typical for settlement refuse. The fragments were also associated with blocks of wattle und daub. We can, therefore, assume that the pit, which was excavated to dispose of the victims, cut into a former refuse pit and was later filled in again with the same debris to cover the bodies. Some of the shards were decorated with patterns characteristic for a region much farther away, in the area around Stuttgart. This suggests that vessels came to Talheim through trade or that one of the women from Talheim—we assume that women were responsible for the production of ceramics—came from this region and continued to produce ceramics according to her original traditions. Is it possible that she may have been kidnapped and brought to Talheim and could even be the cause of the attack on the settlement. She could also have died many years or decades before the attack, leaving behind only her pottery.

Another aspect that needs to be considered is that personal artefacts are missing from the mass grave. In the entire pit, only one tiny limestone splinter was found that might be interpreted as the fragment of a bead. No other objects that might be identified as objects of daily life, decorative elements on clothing, jewellery, or similar objects were found that could possibly be associated with any of the 34 individuals. Regular burials in the LBK usually include items such as pottery vessels, awls, stone axes, knobs to fasten clothing, belt buckles, pendants (e.g. spondylus shells), and sometimes stone arrow points, etc. The typical equipment of a man often also included tools for making fire, a pouch with a piece of pyrite, and a fire steel. Because these types of objects are completely missing, it seems likely that the bodies were plundered before burial. The dead may even have been stripped before being discarded. This treatment suggests that the

people who discarded them had no close emotional ties to them and that attackers themselves probably disposed of the bodies. This is also implied by the chaotic and impious deposition of the dead. Otherwise, it is safe to assume that they would have been buried in the sleeping pose, which was typical for the LBK.

There are some arguments that try to justify the rushed and neglectful burial form (e.g. the dead may have already begun to decompose before they were disposed of). This argument implies that bodies were left on the surface over a longer period (days or weeks?). There is no evidence of tooth or claw marks from rodent and/or carnivores on the bone, which does not support this theory. All of the skeletal material was carefully inspected with respect to this question. These types of lesions are usually found on freely accessible bodies after a brief period of exposure on parts of the skeleton with relatively thin soft tissue coverage (e.g. the orbital rim or the finger bones). However, evidence such as this was definitively not found even on these preferred parts. Empirical values gathered from forensic medicine show that we should expect corresponding defects within 24–48 h (H.G. König pers. comm.). We can accept this period as the maximum time of exposure before inhumation of the dead. These circumstances also represent the major difference between evidence from Talheim and Asparn/Zaya-Schletz. At Talheim, the dead were buried within a short period after the attack, at Asparn/Zaya-Schletz, the incomplete skeletons and gnaw marks on bones provide evidence for a significantly longer surface exposure (Teschler-Nicola *et al.* 1996). The dead were disposed of in the ditch surrounding the settlement at a much later point in time.

The presence of children, aged about 2 years old, among the victims suggests that child kidnapping was not a motive for the attack. It is not wise to steal these or younger children when they still require the care and attention of their mothers.

SETTLEMENT SIZE, STRANGERS, AND RELATIVES

Compared with other epochs and cultures, we are relatively well informed about the appearance, living conditions, nutritional

circumstances, environment and, last but not least, burial rituals of the LBK people in the Early Neolithic in central Europe. Other aspects of daily life, such as hairstyle, men's beards, clothes, and body decorations, can only be indirectly inferred or developed from ethnographical analogies (e.g. Lüning *et al.* 2005). The burial of the dead in the sleeping position and with grave goods suggests that people in the LBK believed in some form of life after death (Hoppe and Jacobi 2005). Yet the world of their gods, possible taboos, initiation rituals, and similar parameters remain a mystery.

Similarly, we can only speculate about the social and political organization of the past population—based on the analyses of (sub) recent, agrarian-living populations (see Gronenborn 2006). The inhumation burials and cremations represent two completely different burial forms that were often carried out at the same time and in the same place, yet it has not been possible to attribute one or the other to a distinct group within the population (Trautmann and Wahl 2005). It has been assumed that the early herders and farmers lived in egalitarian societies. However, fortified settlements from the later phase required a certain amount of planning and division of labour, which imply some degree of hierarchical structures in the society.

The organization into subgroups, 'families', tribes, clans, etc., which were led by an elder, a 'Big Man', or a chief (Lüning *et al.* 2005; Gronenborn 2006) is also not entirely certain. To add to the confusion, larger settlements existed alongside multiple smaller villages in the different regions and might have served as central points, which could have had a greater purpose or function (e.g. Herxheim; Orschiedt and Haidle 2006).

Three generations are represented in the skeletal series from Talheim. Different models have been used to clarify the inner structure of this population. Analyses based on epigenetic traits identified three to four subgroups or lineages (Wahl and König 1987, pp.94–98; see Table 5.1), although groups a and b resemble each other closely and could be combined into one, and group d is the least uniform. Subadults, men, and women are present in each of the three (combining groups a and b) more or less distinct groups. It was also possible to identify diet-related alterations that suggest a correlation between the occurrence of cribra orbitalia and increased tooth crown abrasion (Wahl and König 1987, p.104). Both phenomena only occur together, while other individuals of the same age category do not show porosity in the orbital roof and, at the same time, only minimal

Table 5.1. Individual assignment of anatomic variations/kinship groups within the Talheim population according to the different models

Individual	Age	Sex	Wahl and König 1987	Alt <i>et al.</i> 1995	Eisenhauer 2003	Price <i>et al.</i> 2006	Bentley <i>et al.</i> 2007	Strien and Wahl 2007
83/3A	50–60	Male	b	II	–	–	–	1
83/3B	~30	Male?	a	–	–	Local	–	3
83/3C	~9	Female?	–	–	–	Local	1	4
83/6	~2	Female?	–	–	–	Local	1	2
83/7	30–40	Male?	c	I	–	Local	3	2
83/8	~60	Male?	b	–	–	Local	1	2
83/10B	~25–35	Female?	–	I?	–	Non-local	3	2
83/11	25–30	Male	c	II/III	–	Local	1	1
83/12	20–30	Male	a	II/III/IV	–	Local	1	3
83/13	6–7	Male	–	–	–	Local	1	1
83/14B	2–4	Indet.	–	–	–	Local	1	1
83/15A	~11	Female?	–	II	1	Local	2	1
83/15B	10–12	Male?	–	II	i	Local	2	1
83/18A	50–60	Female?	–	–	–	–	–	2
83/18B	25–30	Male?	b	I	–	Non-local	3	2
83/19	5–6	Male?	–	II?	–	–	–	1
83/20A	20–30	Female	b	III	Runaway?	Non-local	3	1
83/20C	20–30	Female	d	–	–	–	–	1
83/22A	18–20	Female?	–	–	–	–	–	4
83/22B	~40	Female?	a	I	–	–	–	4
83/22C1	~30	Male	d	I	–	Local	1	2
83/22D	~50	Female?	a	–	–	Local	2	3
83/22E	~40	Indet.	a/b	–	–	–	–	4
83/22F	12–15	Female?	–	IV?	2	–	–	3
83/22G	~20	Indet.	–	–	–	–	–	3
83/22H	40–50	Indet.	–	–	–	–	–	4?
83/22J	~5	Female?	–	IV?	2?	Local	1	4
83/22K	~6	Male?	–	–	–	–	–	3
84/2	20–30	Male	–	II	–	Local	2	1
84/4	20–25	Female	c	I	–	Local	2	1/2
84/10	8–10	Male?	–	–	–	–	–	3
84/23	~8	Male?	d	I/II	1	Local	1	2
84/24	~3	Male?	a	–	3	Local	–	3
84/28	~11	Female?	c	II	1	–	1	2

Indet., indetermined.

age-appropriate dental abrasion. This may be an indicator for social differentiation (alternate composition or production of meals) or genetic differences (thickness and hardness of tooth enamel) or it could simply be an indicator for different preferences in gathering activities or preparation of different foodstuffs.

A second attempt looked at odontological characteristics to structure the population (Alt *et al.* 1995). It was possible to build four groups based on rare tooth attributes: we can assume some genetic relationship between individuals within groups I and II, while the cohesion of groups III and IV remains more hypothetical. The core of group I are the two men 83/7 and 83/18B, who could be brothers. Individual 83/22C1 could be another brother or cousin. The woman 84/4 and the child 84/23 complete this group. The core of group II is made up of the man 84/2 and the two children 84/23 and 83/15A. These three could represent a father with his two children. The individuals 83/3A (grandfather?), 83/15B, and 84/28 probably also belong in this group. Overall, the children and juvenile individuals were more closely related to each other than to the entire group or the adults.

The third model used to recognize existing subgroups focused on the question of residence rules in the younger LBK. Eisenhauer (2003) sorted eight subadults into three different groups (see Table 5.1) and then linked the anatomical variations relevant for determining kinship, as determined by Wahl and König (1987) as well as Alt *et al.* (1995) with the data for the individual age at death. From the individual age intervals, it was possible to observe relationships concerning filiation or collateration between individual people. These terms, adopted from cultural anthropology, denominate a lineage (filiation) or a kinship between people that belong to the same generation (collateration). The results showed that the women at Talheim were significantly less similar to each other (less related) than the men; therefore, the residence rule was probably patrilocal (Eisenhauer 2003, p.568), as has been found recently in the later Neolithic skeletal sample from Eulau (Saxony-Anhalt) belonging to the Corded Ware Culture (Haak *et al.* 2008, p.18229). Matrilocality (i.e. the man moving to his wife's village after marriage), can therefore be ruled out. The young adult woman 83/20A showed a conspicuously close relationship to the rest of the population. She could be interpreted as evidence for endogamic marriage or as a widow, divorced woman, or a runaway who returned to her home village.

In the latter case, she could even be seen as the reason for the massacre (Eisenhauer 2003, p.570).

The area identified through surveys as the settlement area at Talheim would have provided space for four to five houses, maybe more. This, and their contemporaneity, will have to be confirmed by excavation. If we assume six to eight people per house, the population would encompass between 24 and 40 inhabitants. Although the 34 individuals recovered from the mass grave represent a demographically balanced distribution of age and sex, it is still possible that the population may have originally been (much?) larger and only a portion of the inhabitants were victims of the massacre or perhaps not all victims were buried in the mass grave. One approach to this problem would be the calculation of an economic model. The number and extent of contemporaneous settlements in the area around Talheim would be identified and the space they require to secure their subsistence calculated. Based on these data, it would be possible to calculate the population that could have existed in this region based on geographical situation (i.e. the available nearby land and land located further away, and to what extent neighbouring villages would have impinged on each other).

Numerous parameters would have to be estimated for this project: primarily the dimension of the settlement, number of expected houses per hectare, number of inhabitants per house, type of crop cultivation (garden culture versus agriculture, pasture versus fields, forest pastures), proportion of cereals (primarily einkorn and emmer), gathered plants (nuts and wild vegetables), pulse crops, and oleiferous fruits, composition and requirements of domestic herds, as well as hunting and fishing in the diet. We must also consider the caloric requirements of juveniles and adults versus children and seniors, and the ecological-climatic conditions (average yearly temperature in the region today is 8–9°C, average yearly precipitation is 800–820 mm/annum: after Wolf 2006/7), which gives the entire project the characteristics of a very complex projection.

Values that were worked out for a LBK settlement in the Wetterau in Hessen represent a first approximation (Ebersbach and Schade 2005): if we assume 0.3 ha of arable land and one cow per person, the 34 individuals from Talheim would have required 10.2 ha of land. The topographic situation would have made it necessary for the people of Talheim to come to an agreement with the closest neighbouring settlement, located 500 m to the west near the bank of the

Neckar. The five next closest LBK villages were located approximately 1.6 km, 1.9 km (two), 2.0 km, and 2.6 km to the south and west of Talheim. These may have dated slightly earlier than the mass grave. The fact that no neighbouring villages were located within 3–4 km to the east and north, could suggest that this area was used for agriculture. However, it could also simply represent a research gap. They may just not have been discovered yet. An additional aspect that needs to be considered in further discussion of the possible expansion and effectiveness of land use are climatic changes that may have played a significant role in the Neolithic (Gronenborn 2005, 2007).

One individual among the skeletal remains from Talheim stands out; compared with the rest of the population, this individual had considerably more robust bones (Wahl and König 1987, pp.92, 185). The bones belonged to an approximately 1.60-m tall, mature man of stocky stature who, based on bodily proportions, may have originated from a foreign population or represents natural variation within a population. Regrettably, it is not possible to correlate remains of the postcranial skeleton with one of the skulls. However, he was probably not one of the attackers. They would not have disposed of one of their own comrades killed during the fight together with the victims; he would have received an honourable burial.

CURRENT RESEARCH AND DISCUSSIONS OVER THE ORIGINS AND RELATIONSHIP OF THE TALHEIM PEOPLE

Recently, isotopic analyses and a new pilot study on DNA preservation were carried out on the Talheim skeletons (Price *et al.* 2006; Bentley 2007; Bentley *et al.* 2008; Pusch, pers. comm.). Measurements of the commonly used isotopic ratios of strontium ($^{87}\text{Sr}/^{86}\text{Sr}$), carbon ($\delta^{13}\text{C}$), and oxygen ($\delta^{18}\text{O}$) returned interesting results concerning composition of the diet and origins of a portion of hastily buried individuals in the mass grave. These should, however, for several reasons, not be overinterpreted. For more detailed information on the methodology and comparative studies see Price *et al.* (2001, 2003), Bentley *et al.* (2002, 2003), Haak *et al.* (2005), and Ammermann *et al.* (2006).

The first analysis was solely based on the measured Sr isotopes (Price *et al.* 2006, fig. 7), which—corresponding to the local bed-rock—are integrated into bone and teeth through dietary intake. Variations imply that the person concerned spent a certain amount of time in another place or consumed food of non-local origins. Thus, the adult woman 83/10B, 25–30-year-old man 83/18B, and young adult woman 83/20A could be considered ‘non-locals’ (see Table 5.1). They may have grown up in another village and came to Talheim through marriage or migration. It has also been discussed whether the varying Sr isotope ratios came to be because individuals concerned spent the time during development of their teeth as shepherds and lived in areas with a geologically different environment or that fields and other agricultural areas located at different altitudes may be responsible for these differences. From the three individuals mentioned above, the teeth 33, 27, and 31 (nomenclature according to FDI), whose crowns are fully developed by age 6–7, were sampled. 83/18B and 83/20A were already assigned to the same subgroup (b) based on epigenetic characteristics. Only small fragments of the skull from individual 83/10B were recovered during excavation. It is also noteworthy that the close relationship, which Alt *et al.* (1995) suggested for the two men 83/7 and 83/18B (see above), could not be verified through the Sr isotopes (Price *et al.* 2006, p.274). Finally, data from the men and children are more similar to each other; the women show a greater variance. Similar results were recovered from the skeletal series from Vaihingen/Enz and based on previous results (see above) meet expectations.

In a second set of analyses, the Sr values were evaluated in combination with the data for carbon and oxygen (Bentley *et al.* 2008). This resulted in three groups: (1) the ‘local group’ (four men and seven children); (2) a family who may have procured their drinking water from another source (one man, two women, and two children); and (3) individuals that may have spent some time away from the village (in regions of higher altitude?) as pastoralists(?) and who may represent social differences to the rest of the population (two men and two women) (see table 1). After publication of the data, the lack of women in group 1 frequently was interpreted as evidence for specific kidnapping of the women as motivation for the attackers. Although the young women do seem to be underrepresented in Asparn/Zaya-Schletz (see Teschler-Nicola *et al.* 1996), in Talheim we must consider the small sample size, the small size of the sub-

group, and the fact that of the 34 individuals recovered, only 20 were included in the analyses. That is to say that at least four late juvenile to adult women were identified among the remaining 14 individuals that were not assigned to a specific group. A statistical examination of the given distribution with the expected values was carried out using the chi-square test (men/women/subadults in groups 1, 2, and 3 = 3.85 : 2.2 : 4.95, 1.75 : 1.0 : 2.25 and 1.4 : 0.8 : 1.8) showed that observed frequencies for all three groups lay within the range of coincidence.

No statistically significant differences in $\delta^{13}\text{C}$ values were found between the average values (Bentley *et al.* 2008, table 3) for the individual isotope ratios of the three groups. The same can be said for $^{87}\text{Sr}/^{86}\text{Sr}$ between groups 1 and 2. The $\delta^{18}\text{O}$ between groups 2 and 3 is slightly significant and highly significant $\delta^{18}\text{O}$ between 1 and 2 as well as $^{87}\text{Sr}/^{86}\text{Sr}$ between 2 and 3 and between 1 and 3. The question arises whether groups 1 and 2 can be clearly separated from one another, particularly as the significance of oxygen isotope data has been viewed more and more critically in recent times (E. Stephan pers. comm.).

The classification of individual 83/7 is significant because Bentley *et al.* (2008) included it in group 3, although the distribution of $\delta^{18}\text{O}/^{87}\text{Sr}/^{86}\text{Sr}$ places it closer to individuals 83/13 and 84/23 who are clearly more closely related to group 1 (Bentley *et al.* 2008, fig. 5a). The $\delta^{13}\text{C}/\delta^{18}\text{O}$ and to a greater degree the $\delta^{13}\text{C}/^{87}\text{Sr}/^{86}\text{Sr}$ ratio both place the individual much closer to group 1 and/or 2. Whether the remaining individuals from group 3 preferred to procure their food from upland regions also needs to be discussed more thoroughly. Individual 83/18B had the highest $^{87}\text{Sr}/^{86}\text{Sr}$ value (0.71067) in the entire series, which still lies within the range of data for the Late Triassic Keuper formation: typical values for the Black Forest would be 0.7130 (mottled sandstone), 0.7150 (granite, gneiss), or higher (E. Stephan, pers. comm.). Kunert and Melsheimer (2008, unpubl.) also encountered uncertainties with regard to the groupings during the statistical evaluation of the isotope data. So the (significance of the) grouping in Bentley *et al.* (2008) mainly depends on the assignment of man 83/7. Now, the somewhat more cautious interpretation of the study by Price *et al.* (2006) seems the most justified. The assignment of the additional Talheim individuals to a total of 57 inhabitants divided into four individual families by Strien and Wahl (2007, fig. 36) is more or less fictional and was attempted for the sake of the exhibit, which tried to visualize the find situation for the public.

In the spring of 2009, we had four bone samples from the mass grave analysed at the Institut für Humangenetik, Abteilung Molekulare Genetik, der Universität Tübingen (Institute for Human Genetics, Department for Molecular Genetics at the University of Tuebingen). They were analysed to determine whether aDNA is preserved and can be amplified and whether sampling of the entire assemblage is justified based on the current state of the science. A first experiment in this area was carried out a few years ago and returned negative results. The results of this new study are very promising. The analyses returned evidence for original mitochondrial as well as nuclear DNA (Pusch, pers. comm.). More detailed analyses are planned for the near future. Only then will it be possible to clear up all of the mysteries concerning family relationships in Talheim (cf. Haak *et al.* 2008). Whether it will be possible to find out if a foreign group took over the settlement in Talheim after the massacre will only be answered through excavation of the settlement's cemetery and a corresponding examination of the skeletal remains.

SUMMARY: FACTS, EVIDENCE, AND POSSIBLE CONCLUSIONS

The structure of the community at Talheim

- Based on the find situation we can assume that the 34 men, women, and children lived, were killed, and buried at the same time. They represent three generations of the same population.
- The age and sex distribution of the examined population suggests that the complete community of a small village was killed. However, we cannot ignore that people may have been 'erased' by another clan that lived in the immediate vicinity, maybe even in the same village.
- The current evidence for the inner structure of the community at Talheim is based on anatomical variations, primarily odontological characteristics, nutritional differences, as well as fictitious assumptions based on the fact that three generations are present. The true family relationships will be clarified using DNA analyses.

- According to Sr isotope data, at least three individuals spent their childhood in another location or were provided with food from another region. They may have married into the clan or came to Talheim as traders, etc.
- The pottery remains from the area around Stuttgart provide evidence for trade or marriage relations over larger distances. However, they do not necessarily have to do with the motives for the attack.

Sequence of events

- The use of bows and arrows suggest that the time of day when the massacre occurred was when the visibility was good. The moment of surprise would have been greatest shortly before sunrise. Some of the victims could have been surprised in their sleep.
- The injury patterns can be traced back to at least the same number of weapons (i.e. attackers/men), as were represented in the examined population. It is probable that the aggressors outnumbered the victims.
- The majority of victims were attacked from behind and the pattern of injuries shows that they did not offer significant resistance. They may have attempted to flee. This also suggests that their attackers outnumbered them. Otherwise they would surely have tried to defend their house and home.
- The lack of animal bite and scratch marks implies that bodies were buried in a timely fashion (less than 24–48 h). To dispose of the dead, a pit of about 9 m³ (at least) was excavated, which—considering the estimated timeframe—also implies a large group of attackers.
- The disposal of the dead probably took place within a few hours of the massacre. Rigor mortis begins (depending on different variables such as outside temperature, metabolic activity before death, blood loss, possible obesity, etc.) about 3 h post mortem, it is complete after 8–12 h and lasts 1–2 days. After the onset of advanced rigor mortis, bodies would have become cumbersome to move.
- The lack of any personal items in the mass grave implies that the dead were plundered and probably also undressed before interment. This and the impious deposition imply that the attackers buried their victims themselves.

- If the aggressors had come to pillage, plunder, and then move on, they would not have had to take the time to bury the dead. It seems logical that they planned to take over the village's resources (houses, animals, farm land, and supplies) and settle there themselves.
- If someone from the village survived, they were not able to bury their relatives according to their traditions.

Attackers and motives

- The spatial distribution, in relation to the skeleton, of the identified skull traumas indicate that the majority of attackers were right-handed.
- The dimensions of one of the axes used in the attack are typical for axes from the Stuttgart area. It is not clear whether all of the attackers came from there as this piece may also have come to the Heilbronn region via trade routes.
- If some people from the local population survived or were not involved in the attack, then it seems that the remaining population did not have emotional or debilitating family ties to the dead. The same can be said about the foreign attackers. The brutal nature of the attack is illustrated if through nothing else, then by the fact that young children were not spared. The attackers acted without mercy.
- Different motives can be considered as reasons for the attack (e.g. blood feud, abduction of women or children, scarcity of resources due to famines or changing climate, neighbourhood disagreements, etc.).
- It is not impossible that a 'run away' woman may have been the cause for the attack.
- An execution or ritual ceremony would have resulted in more uniform defects.

A FINAL WORD

The existing facts are clear and spectacular. They were unique within the LBK up to the discovery of Asparn/Zaya-Schletz in Austria. The

evidence leaves enough leeway for the observer to develop slightly different scenarios for the events at Talheim. The mystery of the events and the fact that the massacre took place in the Early Neolithic period gave rise to numerous references in (popular) scientific publications (cf. Bahn 1996, 48 f.; Husemann 2005). The site is often quoted as one of the worldwide first records for war. It is not clear as to what extent the events in Talheim can be described with this term, it is a question of the definition of the term 'war', which would be beyond the scope of this chapter. Only some aspects of this topic will be pointed out here, for more information, refer to the literature (cf. Frayer 1997; Keeley 1997; Petrasch 1999; Schulting 2006; Armit *et al.* 2007).

The discussion on interpersonal conflict primarily focuses on two parameters: the number and composition of the people involved and the motivation of the opponents or reason for the conflict. The palette varies from internal family conflicts or neighbourhood disagreements, which are usually rather straightforward, to fights between individual clans or tribes that have to do with disagreements concerning territory or conflicts, which are carried out on the backs of hundreds or thousands of warriors and have far-reaching consequences. In addition, there is the exclusive classification of terms such as skirmish, battle, and war, all of which follow the same goal: the implementation or expansion of power, influence, and wealth. Possible additional motives—besides those already discussed above for Talheim—include so-called honour killings, border conflicts, revenge, or genocide, whereby attackers and victims usually cite completely different reasons for the specific conflict.

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The Early Neolithic site Asparn/Schletz (Lower Austria): anthropological evidence of interpersonal violence

Maria Teschler-Nicola

ABSTRACT

The Early Neolithic (Linear Pottery Culture, or LBK) site of Asparn/Schletz, Lower Austria, comprises a settlement enclosed by two fortification trenches, an oval construction (including a chronologically younger outer trench and an older inner trench) and a trapezoidal trench. During systematic investigations between 1983 and 2005 a plethora of unexpected archaeological and anthropological results was obtained: the human skeletal remains of 67 individuals were found at the base of the outer ditch of the oval trench system; findings recovered there date to the end of the Linear Pottery Culture (ca. 5000 BC, represented by Notenkopf and Želiezovce cultures); and regular burials are absent. Without exception, the skulls ($n = 33$) recovered at the ditch—often in close proximity to entrance causeways—are characterized by multiple traumas of peri-mortem origin. Among them, we observed direct bending fractures at the neurocranium, indirect fractures at the cranial base, fractures of the facial bones, as well as of mandibles and teeth. In addition, a few postcranial remains reveal peri-mortem breakage patterns. The unusual dismemberment and disarticulation of the skeletons, and specific defects at certain distally and laterally oriented portions of the skeletons were ascribable to gnawing by animals. These features are interpreted as consequences of the corpses having remained unburied for an extended period. Our findings

imply that inhabitants of the Asparn/Schletz site were victims of a violent conflict. This act may have also have led to the final demise of the settlement, because there are no archaeological traces for continuity of settlement activity. In order to test this assumption, direct ^{14}C AMS measurements of specimens with clearly identifiable lesions were performed. The result of a chi-square test carried out with the AMS data support our hypothesis that the individuals were contemporaries. Additionally, the age and sex distribution reveals a lack of young females, who are interpreted as having been abducted by aggressors.

Further evidence of a probably increased level of interpersonal violence at the end of the Linear Pottery Culture (ca. 5000 BC)—probably as a result of an economical crisis and/or gradual population movement—comes from the site of Talheim in western Germany (coeval with the massacre observed at Schletz), possibly also from the Herxheim site, although the interpretation of that site is still debated (see Orschiedt and Haidle, this volume, Chapter 7).

Here we briefly summarize previous findings, discuss differential diagnostic aspects of neurocranial and facial fractures (which can be difficult to identify in buried, taphonomically altered skeletal remains), and discuss the results within the context of other final Linear Pottery Culture findings.

INTRODUCTION

Although the Linear Pottery Culture (or Linearbandkeramik; LBK) throughout Europe is considered to be a well-documented period of prehistory (Lüning 1982; Lenneis 1995), our knowledge of the period, and in particular its final phase, has been substantially enriched by systematic archaeological investigations of the settlement at Asparn/Schletz, in northeast Lower Austria.

Though the site was already known, it was only in the early 1980s that the Austrian federal army discovered landscape features in this district by aerial prospecting, which were finally interpreted as a filled ditch system surrounding a settlement (Trnka 1982). Since 1983, the construction that encloses more than 245 000 m² has been investigated systematically in annual excavation campaigns by the Niederösterreichisches Landesmuseum under the direction of Helmut

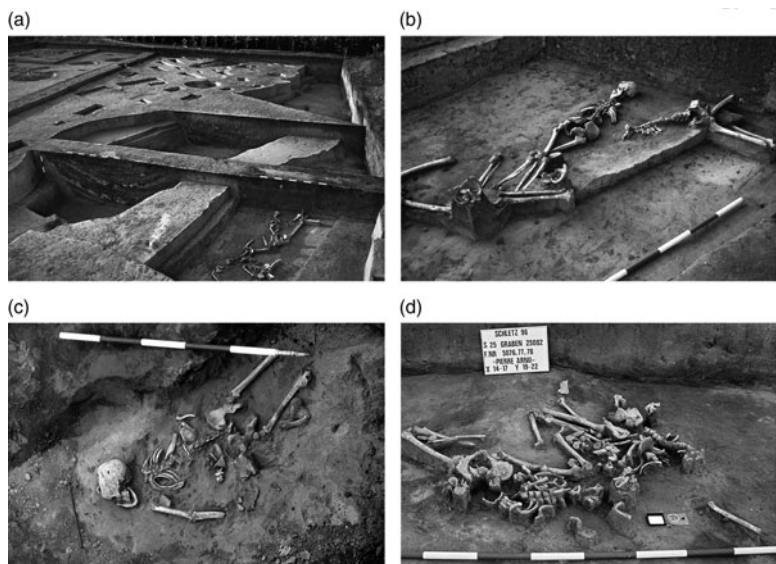


Figure 6.1. (a) Asparn/Schletz, ditch system: overview of the oval double ditch system with human relics *in situ*. (b) Asparn/Schletz, ditch system: detail of the skeletal assemblage (*in situ*, close to the south gate). (c) Asparn/Schletz, ditch system: *in situ* example of an incomplete preserved human skeleton. (d) Asparn/Schletz, ditch system: *in situ* example of two incomplete preserved human skeletons.

Windl (Windl 1994, 1996, 2001, 2009); up to now about 20% of the total area has been archaeologically examined.

Following Windl's (1996) suggestion, the complex ditch system, which encloses the settlement, has the character of a fortification; it consists of two elements, an oval and trapezoidal enclosure. Both ditches are made in the form of a 'Sohlgraben' and reach a maximum width up to 4 m and depth up to 2 m. At some places causeways, which are to be interpreted as gate constructions, could be identified. The archaeological remains recovered from these ditches—ceramics, bone, and stone tools—belong to the younger 'Notenkopfkeramik' (i.e. they are to be assigned to the final phase of the LBK). Radiocarbon dating provides an age between 5210 and 4950 cal bc (Wild *et al.* 2004).

The oval fortification construction is represented by two parallel ditches and nearly all of the human skeletal remains we are dealing

with in the present chapter were discovered at the base of the external ditch serving the settlement (Figure 6.1a). They were found in atypical postures (Figure 6.1b–d), often in prone positions with randomly crossed limbs and unnaturally bent torsos. Most of the skeletons were incomplete; whereas the distal parts of the skeletons, especially the hands and feet, were missing, the trunk with ribs and vertebrae together with the pelvic bone is often extant (Figure 6.1c). In some cases, only skulls or fragments of skulls have been discovered in an unclear, seemingly arbitrary, context.

Although human skeletons and fragments are frequently found within Early Neolithic settlement pits and ditch systems, such as at Vaihingen (Krause 1997; Welge 1997), Talheim (Wahl and König 1987; Wahl and Strien 2007), Wiederstedt (Meyer *et al.* 2004), Herxheim (Häußer 1998; Haidle and Orschiedt 2001; Orschiedt *et al.* 2003, 2006; Zeeb-Lanz *et al.* 2007), Barleben (Lies 1963), and Ober-Hörger (Kneipp and Büttner 1988), the Schletz site takes special position among them due to the unusual positioning of human remains and their peri- and post-mortem changes, which characterize the entire skeletal sample. We assume that a ‘massacre’ may have been responsible for the final demise of the settlement (Teschler-Nicola *et al.* 1996, 1997, 1999). This hypothesis is corroborated not only by the radiocarbon data, which are consistent with the contemporaneity of a statistically relevant number of individuals, but also by the archaeological features.

As excavations are still ongoing, the present chapter will restrict the discussion to a summary of the demographic features and the variable peri- and post-mortem skeletal changes, with particular attention to a few exemplary cases. Finally, we try to place the Asparn/Schletz findings in the wider context of the LBK.

Table 6.1. Age at death and sex distribution at the late Linear Pottery site of Asparn/Schletz ($n = 67$)

	N(tot)	%	N(m)	%	N(f)	%	N(?)	%
Infans I	12.5	17.2	–	–	–	–	–	–
Infans II	8.5	12.7	–	–	–	–	–	–
Juvenil	5.5	8.2	2	2.9	1.5	2.2	2	2.9
Adult	22.5	33.6	16.5	24.6	5	7.5	1	1.5
Matur	18	26.9	9.5	14.2	8.5	12.7	–	–
Total	67	100	28	41.8	15	22.4	3	4.5

RESULTS

Demographic features

Up to now a section of about 20% of the ditch system has been excavated, without any regular graves having been found (two graves, belonging to the early phase of the LBK have been recovered, but they are not the subject of this study; see Windl 2009). By considering morphological and/or anatomical features of the skeletal remains (e.g. the length or robusticity of long bones or form and extent of muscle insertions), 67 individuals could be identified (Teschler-Nicola *et al.* 1996; see Table 6.1). As the number of individuals is small and the archaeological investigations continue, we merely refer to the number and frequencies of individuals represented in each age category and abstain from a detailed analysis (e.g. the calculation of mortality tables). Interestingly, the age at death distribution observed corresponds roughly to that known from representative prehistoric (e.g. Early Bronze Age) grave fields (Teschler-Nicola and Prossinger 1992): 26 (38%) of the 67 individuals at Asparn/Schletz are immature, and 41 (62%) are adult, of which 26 were sexed as male, and 13 as female, with only one indeterminate (table 1). Whereas the sex ratio of older individuals (40–60 years) is balanced (10 males/nine females), the sex ratio of younger individuals (20–40 years) is unbalanced (17 males/five females) (i.e. the number of young males compared with that of young females in this age group is greater by a factor of approximately 3). Such an age and sex distribution is noteworthy (although not statistically significant: $\chi^2 = 3.075$, $P = 0.07$, particularly when we consider the number of younger infants ($n = 12$, among them four neonates).

While investigators of the Late LBK assemblage at Talheim attempted to explain their similar result by a secondary female deficit (caused by an enhanced biological vitality of mature females or higher risks due to pregnancy and birth of young females, Wahl and König 1987), we forward a different hypothesis. Considering the radiocarbon data and peri-mortem skeletal changes observed, we assume that the skeletons recovered at Asparn/Schletz represent a cross-section of a 'living population' and interpret the dearth of young females as a result of their abduction by aggressors. The discovery of skeletal remains of very young children in the absence of their putative

mothers makes this assumption even more plausible. Thus, according to our view, young males are not overrepresented, but rather young females are underrepresented.

Traumatic lesions

A considerable number of papers in the field of forensic medicine, clinical medicine, and bioarchaeology deal with biomechanics of the skull and differential diagnosis of neuro- and viscerocranial injuries (Haberda 1923; Müller 1975; Prokop and Göhler 1975; Arbab-Zadeh *et al.* 1977; Prokop and Radam 1992; Frayer 1997; Peter-Röcher 2002; Hardt and Kутtenberger 2010). Although many palaeopathologists are more or less familiar with the principal diagnostic criteria of such injuries, identification of rarely observed facial skull fractures or cranial base fractures in taphonomically altered, inhumed human skeletal remains is still a challenging matter. In the following section, we discuss the frequencies and refer to a few types of traumatic skull lesions identified within the (macroscopically well-preserved) Asparn/Schletz assemblage.

Depending on the direction and force of the impact, we distinguish generally between direct or bending fractures (occurring from direct force at the point of impact) and indirect or bursting fractures (occurring at points/areas other than the point of impact and therefore a result of shape changes/compressions of the whole skull). In many cases, both forms are combined.

The Asparn/Schletz sample comprises skulls and skull fragments of 33 individuals, including all ages, and both males and females. It is noteworthy that the entire sample (100%) reveals perimortally induced bending and burst fractures and that all areas, neurocranial and viscerocranial portions are concerned. Most of the specimens reveal bending fractures of different size and shape (Figures 6.2a–f, 6.3b, and 6.4a,b). This fracture type is caused by a substantial force directed at a limited part of the cranium and occurs preferably in the diploic bone architecture of the calvaria (not at the skull base; Hardt and Kутtenberger 2010). Characteristic of this type of fracture is a shaped impression—often implying the use of different objects (e.g. flat axes or shoe-last adzes)—and radially oriented rupture cracks appearing over the entire skull vault. The cracks are the result of a deformation (compression) of the skull; they also can occur in a greater distance to the impact area, such as the

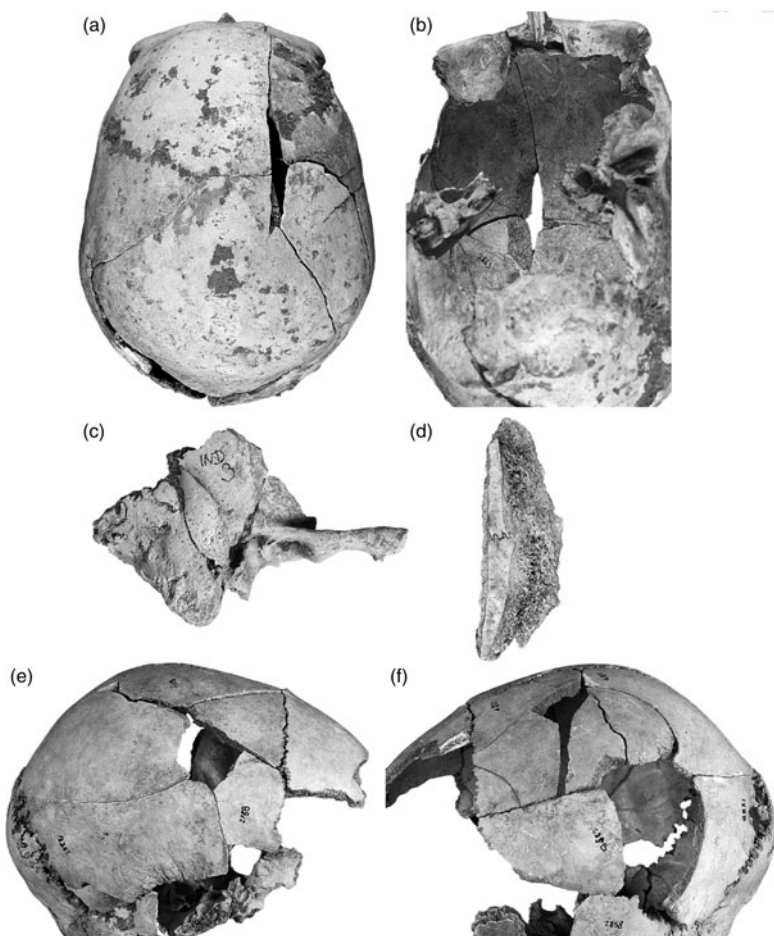


Figure 6.2. (a) Asparn/Schletz, individual 3, male, about 35–40 years: direct bending fracture, ectocranial view. (b) Asparn/Schletz, individual 3, male, about 35–40 years: direct bending fracture, endocranial view. (c) Asparn/Schletz, individual 3, male, about 35–40 years: right temporal bone fragment with a vertically oriented fracture line caused by indirect force from lateral (transversally oriented skull base fracture). (d) Asparn/Schletz, individual 3, male, about 35–40 years: isolated bone fragment belonging to the bending fracture. (e) Asparn/Schletz, individual 19, female, approximately 20 years: multiple bending fractures, right lateral view. (f) Asparn/Schletz, individual 19, female, approximately 20 years: multiple bending fractures, left lateral view.

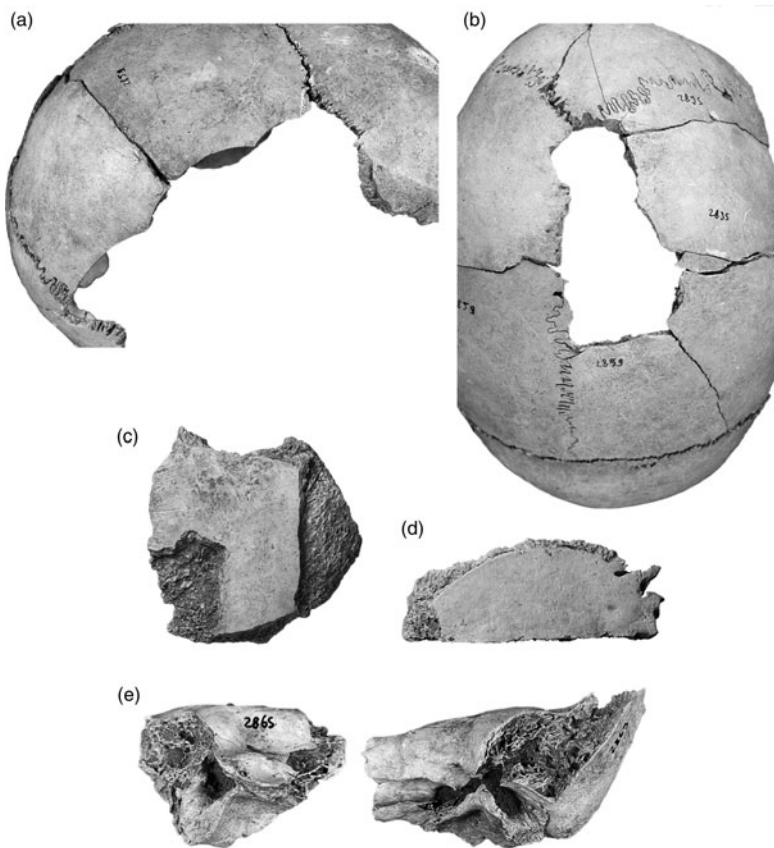


Figure 6.3. (a) Asparn/Schletz, individual 20, immature, approximately 9 years: multiple bending and burst fractures, right lateral view. (b) Asparn/Schletz, individual 20, immature, approximately 9 years: bending fractures at the vertex and rupture cracks, craniocaudal view. (c,d) Asparn/Schletz, individual 20, immature, approximately 9 years: isolated fragments with sharp and curved fracture lines belonging to the side wall of the skull. (e,f) Asparn/Schletz, individual 20, immature, approximately 9 years: right and left isolated petrous bone fragments caused by indirect force from lateral direction (transversally oriented skull base fracture).

skull base, where less elastic, fine bone plates exist. Bending fractures are characterized by curved, sharp edges at the external skull layer and conically extended towards the internal skull layer (i.e. an internal bevel). This phenomenon is a product of differences in the tensile and compression strength of the internal and external skull

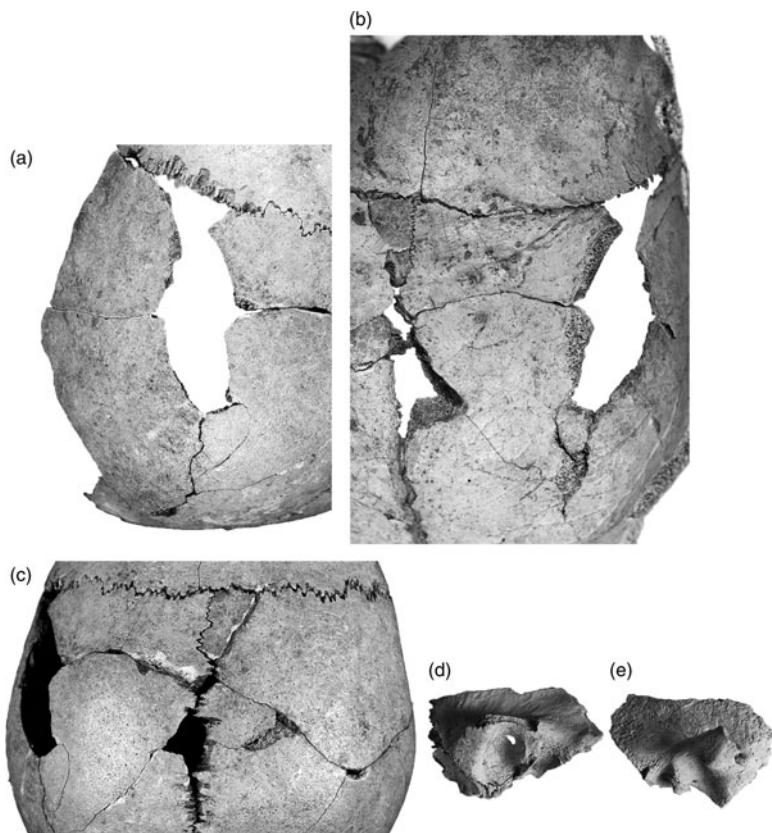


Figure 6.4. (a) Asparn/Schletz, individual 56, female?, approximately 40–50 years: bending fracture at the left parietal bone, ectocranial view. (b) Asparn/Schletz, individual 56, female?, approximately 40–50 years: bending fracture at the left parietal bone, endocranial view. (c) Asparn/Schletz, individual 56, female?, approximately 40–50 years: rupture cracks spalled ectocranially. (d,e) Asparn/Schletz, individual 56, female?, approximately 40–50 years: fragments of the right and left temporal bone with indirect burst fractures (a transversally oriented skull base fracture) due to a heavy blow from lateral.

layers (see Figures 6.2b and 6.4b). Frequently, small removals along the rupture cracks at the outer skull layer are identifiable as well (Figure 6.4c).

Single fractures seem rather to be the exception, but this finding could be affected by the fragmentary nature of the remains. The

appearance of the fractures, in particular the high degree of fragmentation observable in the entire assemblage at Asparn/Schletz (including a considerable number of very robust male individuals with extremely thick-walled crania), implies the use of mainly blunt weapons by the aggressors. Haberda (1923) formulated that such fragmentation might only be achieved with high impact force and power; he doubted that it generally could result from a single blow. However, he does not exclude that this is possible after repeated blows. It is noteworthy that multiple injuries with up to eight certainly identifiable impact points dominate (Figures 6.2e,f, 6.3a,b, and 6.4b,c). In exceptional cases, it is possible to rank the sequence of inflicted bending fractures by using the well-known Puppe's rule (rupture cracks of a later fracture terminate in the cracks of earlier fractures (e.g. Figure 6.2f)).

In contrast to bending fractures a distortion of the whole skull 'by a broad impact [...] may cause burst fractures (running longitudinally or transversally) and comminuted fractures directly at the impact site or the energy may be dispersed and lead to a compression of the skull and skull base, developing comminuted fractures indirectly' (Hardt and Kuttenger 2010, p.55). A transverse impact will result mostly in transverse fractures of the skull base. In the Asparn/Schletz skull sample we found at least three 'classical' cases of indirect skull fractures, where the fracture line runs transversally through the region of the petrous part of the temporal bone, above the external auditory meatus and leading edge of the petrous bone (Figures 6.2c, 6.3e (left and right), and 6.4d,e). Such a breakage pattern, where the impact vector is directed from a lateral direction, is observable (e.g. in a 9–10-year-old immature (individual 20, Figure 6.3a,e)). This form of damage is caused by a 'side-to-side compression' (Arbab-Zadeh *et al.* 1977) and would mean that the injured person was already lying on the ground (the head fixed unilaterally) when a broad impact with a large force/weapon was exerted. The assumption is substantiated by the occurrence of curved fracture lines and the preserved isolated corresponding fragments of the parietal bones (Figure 3a,c,d), which imply a complex multiple breakage pattern with both bending and burst fractures combined.

In cases in which a weapon did not leave a unique, identifiable mark behind or if only fragments are preserved, traces of suture bursts, burst fractures, or rupture cracks were used to localize the impact point and to reconstruct the course of the incident. One

example, the so-called 'ring-fracture', should be mentioned here: the fracture line runs within an area of small bone structures around the foramen magnum, where no direct application of force is possible. In this case, the impact vector that has hit the skull vault from a craniocaudal direction pushed the vertebral column against the cranial base (compression); similar features are formed when the skull base is pulled away from the vertebral column (traction) (Müller 1975). Although the individual concerned is represented by only two fragments of the frontal and occipital bone, the impact force and the impact point could roughly be reconstructed: the damage results from a raw act of violence in the form of a strong blow to the top of the head using a heavy blunt weapon.

As was to be expected, we also found many upper-, mid- and lower-face fractures, as well as tooth fractures. According to Hardt and Kuttenger (2010, p.57) 'the skeleton of the midface is resistant to enormous forces approaching the midface region from below as the mandible absorbs a part of the traumatic energy'. The fractures observed at the mandible, the zygomatic complex, the anterior alveolar process, and teeth, which are caused by impact vectors directed to the infranasal region or towards the mid- or lower face (Figure 6.5a–f) may be seen as indicators of enormous forces, substantiating our hypothesis of a massive violent interpersonal conflict. Three examples are reported in detail here. The lower jaw injury observed in a 7-year-old child (individual 15, Figure 6.5c) is unambiguously of peri-mortem origin. It concerns a horizontally oriented fracture of the inferior margin as well as two body fractures running roughly vertically. Its supposed genesis is a blunt force oriented horizontally towards the lower face. The upper jaw of individual 4, an adult male, shows a Le Fort I fracture (Kuner and Schlosser 1995). The breakage line in this case typically takes a course between the nasal incisure and the canine fosse. However, in this case a section of the alveolar process and corresponding teeth are disrupted as well (Figure 6.5f). This pattern results from a horizontally striking blunt force to the lower face whereas the mandible fracture observed in individual 2 (a vertically running corpus fracture) originates from a craniocaudally directed impact to the margin. This application of force is particularly supported by the dental fractures, which concern the antagonists (Figure 5a; other cases are shown in Figure 6.5b, f).

We also have attempted to localize the identified fractures in different regions of the neurocranial and facial skull. The results of

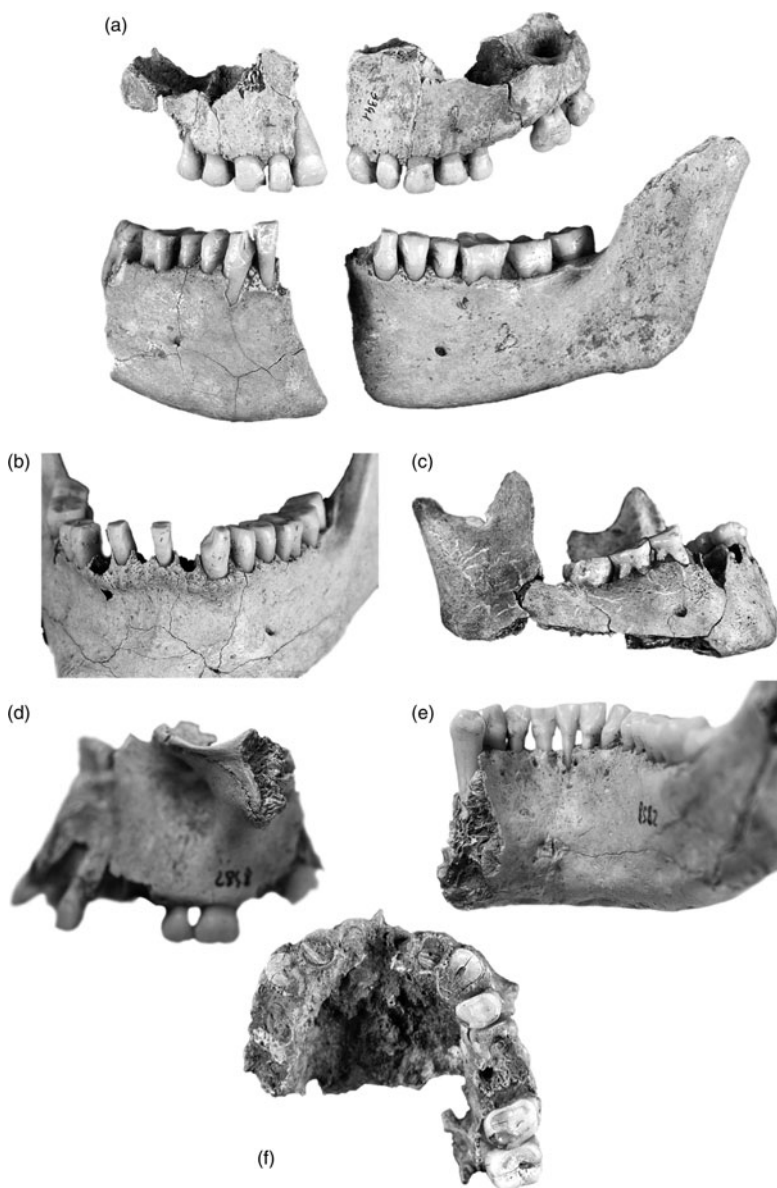


Figure 6.5. (a) Asparn/Schletz, individual 2, male, approximately 35–50 years: example of an upper and lower jaw fracture accompanied by teeth (canine) fractures. (b) Asparn/Schletz, individuals 3, male, approximately 35–40 years (see also Figure 2): peri-mortally caused crown fracture of the left lower canine. (c) Asparn/Schletz, individual 15, immature, 6–7 years: horizontally and vertically oriented fractures of the right mandibular corpus due to a blow to the lower face. (d,e) Asparn/Schletz, individual 19, female, approximately 20 years (see also Figure 2): fracture of the left zygomatic bone and left mandibular corpus. (f) Asparn/Schletz, individual 4, male, approximately 35–55 years: fracture of the alveolar bone and teeth of the upper jaw.

the statistical analysis (174 injuries were observed on the cranial remains of 33 individuals) show that the right side was injured approximately as often as the left (34 and 32, respectively). This suggests that, contrary to the expectation of a predominance of injuries to the left side of the head in face-to-face encounters between right-handed assailants, injuries were just as likely to be inflicted from behind, implying that a number of victims were struck as they were fleeing; nor were immature individuals spared. An age- and sex-specific distribution does not occur, neither in the frequency of severe traumas nor in their localization on the skull. Besides these traumas caused either by stone or wood implements, we also observed one (unhealed) skull injury in a subadult caused by an arrowhead. Fractures of the postcranial skeleton seem to be extremely rare (one probable fracture occurs to a pelvic bone, another to a tibia). Furthermore, we identified two 'pseudo-trephinations' on cranial remains attributable to males, showing medicated/treated and well-healed skull traumas (see Teschler-Nicola *et al.* 2006).

Postmortem alterations of the skeletons

The detailed excavations at Asparn/Schletz allow us to exclude subsequent disturbance due to grave robbing or to recent agricultural activity as a reason for the incompleteness of the recovered skeletal remains. As the remains were embedded in loess, the remains were macroscopically very well preserved, so that the dismemberment and disarticulation of the skeletons as well as specific defects on certain parts of the skeleton could be ascribed to gnawing by animals (Figure 6.6a–f). We interpret such gnaw marks as the consequences of corpses lying uncovered on the surface for an extended period. Considerable attention has been devoted by palaeontologists, archaeozoologists, and archaeologists to identify evidence of scavenging on animal and human carcasses (Sutcliffe 1973; Hill 1979; Binford 1981). Pucher (1992) presented a meticulous analysis of a partly preserved horse skeleton, recovered from a Middle Bronze Age pit (Unterhautzenthal, Lower Austria). Both the location of gnaw marks and their shape and size are identical with those observed on the Neolithic human skeletons from Schletz, where bite marks occurring on the ribs and superior margin of the pelvic bone are most convincing (Figure 6.6a,b). Near the joints (e.g. the greater trochanter of the femur), small ovoid depressions (maximum diameter 5 mm) and

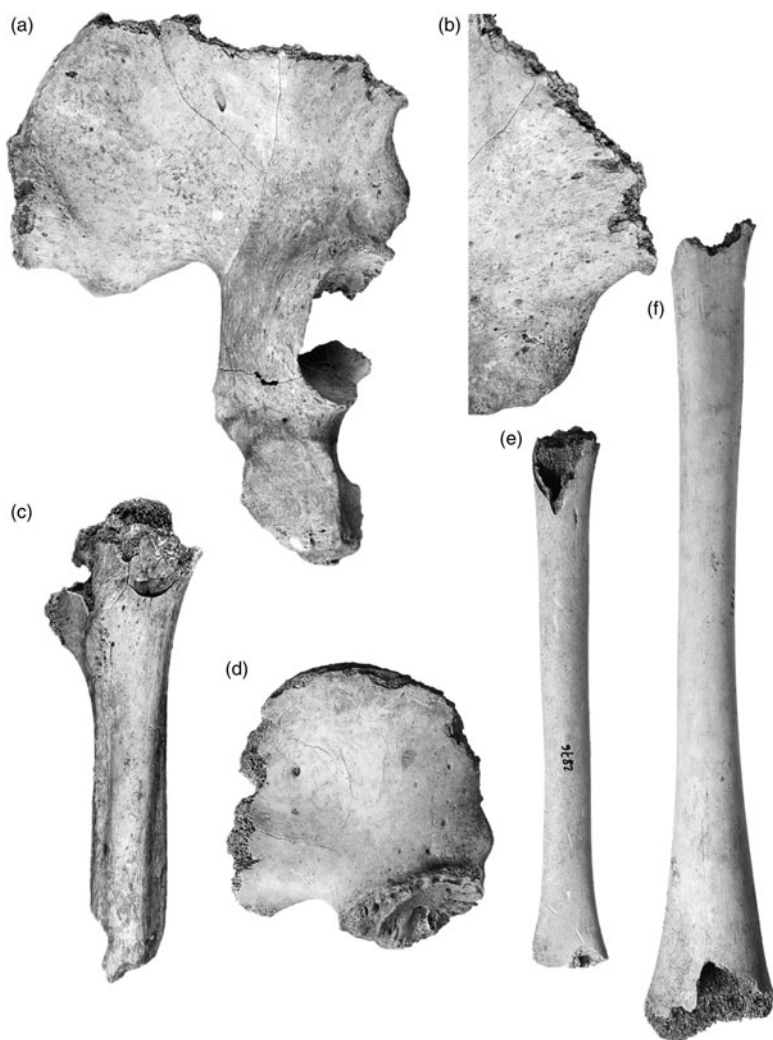


Figure 6.6. (a) Asparn/Schletz, individual 6, male, approximately 20–30 years: right pelvic bone with animal gnaw marks at the pelvic rim. (b) Asparn/Schletz, individuals 6, male, approximately 20–30 years: right pelvic bone with animal gnaw marks at the pelvic rim – detail. (c) Asparn/Schletz, individual 2, male, approximately 35–50 years: depression of the compact bone at the trochanter due to scavenging. (d–f) Asparn/Schletz, individual 20, immature, approximately 9 years: right ilium showing bite marks at the iliac spine anterior superior; left humerus and left femur with gnaw marks at the epiphyses.

Table 6.2. (a) Animal gnaw marks at the upper limbs, shoulder girdl and costae observed at the skeletal remains from Asparn/Schletz ($n = 67$)

Skeletal element	n (observed)	n (affected)	%
Scapula, left	15	4	26.7
Scapula, right	10	5	50.0
Clavicle, left	12	8	66.7
Clavicle, right	13	5	38.5
Costae	15	7	46.7
Hum. prox., left	11	2	18.2
Hum. prox., right	6	2	33.3
Hum. dia., left	13	1	7.7
Hum. dia., right	9	1	11.1
Hum. dist., left	10	5	50.0
Hum. dist., right	7	3	42.9
Rad. prox., left	8	–	–
Rad. prox., right	4	–	–
Rad. dia., left	11	–	–
Rad. dia., right	6	–	–
Rad. dist., left	5	2	40.0
Rad. dist., right	2	1	50.0
Uln. dist., left	5	3	60.0
Uln. dist., right	2	1	50.0

dia., diameter; dist., distal; Hum., humerus; prox., proximal; Rad., radius; Uln. ulna.

(b) Animal gnaw marks at the lower limbs and pelvic bones observed at the skeletal remains from Asparn/Schletz ($n = 67$)

Skeletal element	n (observed)	n (affected)	%
Pelvic, left	23	5	21.7
Pelvic, right	24	6	25.0
Fem. prox., left	24	2	8.3
Fem. prox., right	19	4	21.1
Fem. dia., left	24	1	4.2
Fem. dia., right	25	–	–
Fem. dist., left	24	11	45.8
Fem. dist., right	19	11	57.9
Tib. prox., left	13	3	23.1
Tib. prox., right	10	1	10.0
Tib. dia., left	15	1	6.7
Tib. dia., right	1	–	–
Tib. dist., left	10	3	30.0
Tib. dist., right	7	4	57.1

dia., diameter; dist., distal; Fem., femur; prox., proximal; Tib., tibia.

crateriform crushing of the compact bone is often visible as well (Figure 6.6c). The axes of these craters continue obliquely into the spongy substance of bone, and are almost parallel and only slightly offset. These features led us to assume that the corpses remained accessible to scavenging dogs or wolves for an extended period. A further argument underpinning such a conclusion is that in many cases at the Asparn/Schletz ditch system distal portions of the extremities are missing.

Table 6.2a,b show the skeletal elements recovered and number and frequencies of bones exhibiting evidence of scavenging. Cranial remains are less involved; we counted just one maxillary fragment with minor damage by gnawing. Most frequently the distal portions of the upper and lower extremities and shoulder region (e.g. lateral part of the left clavicle: eight of 12 specimens), including acromion process of the scapular spine and the coracoid process as well as the pelvic bone (iliac crest) were affected. The extent of damage varies depending on the bone type—whether compact or cancellous bone—between slight furrows, scoring, punctures, and pits, and irregular chewed and crushed jagged edges, often associated with splintering or spiral fracturing (Figure 6.6d–f). According to Haynes (1982, 1983) the gnawing pattern resulting from tooth morphology, jaw mechanics, and strength relative to the bone is characteristic for the species. In the case of Neolithic skeletons of Asparn/Schletz, the features indicate gnawing by carnivores.

Of interest in this context is the observation that the degree of preservation of skeletal remains permits conclusions about the length of time the skeletons remained exposed. Haglund *et al.* (1988, p.988) found that ‘approximately 70% of all skeletal elements were recovered when the postmortem interval was 4½ months or less. After six months there was a notable decrease [...] of expected bones’. We cannot resolve this issue through the bioarchaeological analysis of skeletal remains alone, but can conclude at this point in our investigations that the dead of Asparn/Schletz must have remained exposed for quite some time, possibly for up to half a year.

DISCUSSION

The above results of the demographic and palaeopathological analysis of the skeletal remains from Asparn/Schletz present a picture of the

entire population of this early farming settlement having been extinguished. In the context of other novel findings (e.g. from Herxheim) (Zeeb-Lanz *et al.* 2007; Boulestin *et al.* 2009; Zeeb-Lanz 2009) these results just recently led to a lively discussion about the end of the LBK phenomena in Europe. Following the Asparn/Schletz and Herxheim findings, results obtained at the remains discovered at the Talheim mass grave, which were already presented in 1987, attracted renewed attention (Wahl and Strien 2007). Talheim dates to the same period as Asparn/Schletz, with an average ^{14}C date of 6107 ± 22 BP, 5210–4860 cal BC, based on seven samples, while Asparn/Schletz averages 6135 ± 23 BP, 5210–4950 cal BC (Wild *et al.* 2004; the analyses of 12 individuals characterized by skull injuries were carried out within the scope of a research project at VERA, the Vienna Environmental Research Accelerator; see Lenneis *et al.* 1995; Stadler 1995). The Talheim assemblage comprises 34 impiously ‘deposited’ individuals (18 adults and 16 subadults) characterized by demographic parameters, in particular a deficit of young females, and peri-mortem lethal injuries that resemble those at Asparn/Schletz. While the authors explained the deficit of young females as a ‘secondary deficit’ of women caused by birth complications and/or a higher vitality of older women (Wahl and König 1987), we hypothesize, as discussed above, an artificial deficit perhaps associated with the abduction of young females. The fact that newborns are present at the Asparn/Schletz site seems to confirm our conclusion. Another difference between the two sites manifests itself in the treatment of corpses after death: animal gnaw marks are absent on the skeletal individuals recovered at Talheim and it seems plausible that victims were hastily buried in a settlement pit soon after they passed away. In conclusion, this finding would imply that at least some inhabitants had to have survived. Schletz differs conspicuously in that respect: here all the inhabitants might have died or left the settlement in the course of a local/regional conflict. This assumption can be confirmed by archaeological findings. This is because there is no evidence known thus far that would corroborate a continuation of activity at the settlement after the conflict, and direct radiocarbon data do not yield a statistically significant diversity between the 12 randomly selected individuals (exhibiting skull traumas) implying that they were contemporary (Wild *et al.* 2004). The close correspondence in the radiocarbon dating of human skeletal remains from Asparn/Schletz and Talheim

suggests that the conflicts occurred more or less simultaneously—despite their geographical distance.

The final LBK site of Herxheim contrasts slightly as regards the radiocarbon dating (average ^{14}C age 6172 ± 30 BP, 5260–5000 cal BC, based on four samples; Wild *et al.* 2004), but also in several other aspects (Häußer 1998). Human skeletal remains were not found in an ‘irregular manner’ at the ditch base, such as in the case at Asparn/Schletz; instead, the remains mainly seem to represent ‘funerals’. These assemblages differ remarkably in terms of taphonomy (i.e. their preservation as well as their associated finds, from all known younger LBK sites). At Herxheim spectacular deposits composed of nest-like aggregations, clusters of intentionally mutilated smashed human bones, which were mixed with animal remains and other objects of utility, were found. In many cases, these ‘nests’ (Spatz 1998) contained not only fragmented human long bones but also human calottes. The latter were prepared in a strictly uniform kind of technology resulting in a bowl-shaped form. The morphology of the fracture edges demonstrate that these manipulations were carried out at a point when collagen was still preserved (i.e. presumably immediately or shortly after death). Noteworthy is also that the Herxheim assemblage—in contrast to the findings of Talheim and Asparn/Schletz—features cut marks, indicating disarticulation and defleshing (Boulestin *et al.* 2009).

It is obvious that the pseudo-ditch system of Herxheim was used as ‘burial place’ and bears in that respect resemblances to other LBK sites (e.g. Vaihingen; Krause 1997). Nevertheless, the artificial shaping/fragmentation of human crania at Herxheim, in particular the cutting-related modifications, makes it possible to gather and discuss otherwise hardly tangible practices of this early agrarian culture. It is clear that this settlement will play a key role in the process of shaping our view of the final phase of the LBK, in particular regarding their cultural and ritual concerns. It seems appropriate to investigate further explanatory models and, possibly, as mentioned in a previous article (Teschler-Nicola *et al.* 2006), to consider the idea of ‘cannibalism’—in spite of some objections (Spatz 1998). Even Petrasch (1999, p.514, footnote 10) who considered this matter critically did not exclude—at least in a footnote—‘that hunger-cannibalism really might have existed in extreme distress . . .’. Interestingly, just recently, Boulestin *et al.* (2009) reported evidence of cannibalism (but could not distinguish between endo- and exocannibalism) in the course of a

qualitative and quantitative study of modifications, as these features share similarities with those observed in animal butchery. However, Haidle and Orschiedt (2001; Orschiedt and Haidle 2009; also see Chapter 7, this volume) interpreted the aggregations of skeletal remains and the unusual make-up and fragmentation of the human relics discovered at Herxheim as part of a 'secondary funeral' ritual and rejected the hypothesis of cannibalism.

CONCLUSIONS

For a long time some researchers have argued that the LBK was ended by a European-wide crisis (Farrugia 2002). The ditch constructions, whose defensive character is evident, appear more often at this time of changes and seem to document an increased need for security by the population at this time. According to Lüning (1991, p.63) these ditch constructions mirror 'a change within Linear Pottery society, which obviously is related to the disappearance of the whole Linear Pottery culture'. Numerous other findings also point to an increase in potential conflict in the younger phase of the LBK; among others, an increase in population density and a related higher population pressure, the overuse of subsistence resources (Lüning 1982) leading to pressure on the best agrarian fields. The latter probably forced younger LBK people to use waterless loess areas for settlement; in such cases—as at Asparn/Schletz—wells were to be constructed (Kaufmann 1997); there is also evidence suggesting climatic changes towards a dry period that was accompanied by a lowering of the ground-water level (Jäger and Kaufmann 1987). Relevant to this discourse is archaeological evidence documenting a regionalization of stylistic elements (e.g. in pottery) as well as changes or shortages in the supply of raw materials in the younger phase of the LBK. Based on these assumptions, small-sized, separated areas of communication with a distinctive consciousness of identity and a higher conflict potential can be deduced.

The latter becomes, in our view, visible in the findings of the mass grave at Talheim and the ditches at Asparn/Schletz. Whether and to what extent special funerals (possible sacrificial rituals as a measure against perceived threats as discussed, e.g. for the settlement of Menneville; Hachem *et al.* 1998) or secondary funerals fit in (as for

example at Herxheim) remains subjects for further analyses. For the present there are still many open-ended questions. (For example, it is unclear whether the geoclimatic event in the Black Sea shelf region, dated to approximately 5500 BC by Ryan and Pitman (1998) and responsible for the submergence of huge areas of adjoining fertile arable land, might have affected population dynamic processes and/or cultural and societal changes in central and western Europe ca. 5000 BC).

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Violence against the living, violence against
the dead on the human remains from
Herxheim, Germany. Evidence of a crisis
and mass cannibalism?

Jörg Orschiedt and Miriam Noël Haidle

ABSTRACT

Since their discovery, human skeletal remains of the Herxheim pit system, like individuals from the mass grave at Talheim and the earthwork of Asparn/Schletz, have often been taken as a proof for violent conflicts and for a crisis at the end of the Linear Pottery Culture. Yet, different from Talheim and Schletz, no clearly lethal trauma can be attributed to any of the minimum of 325 individuals from Herxheim. The highly fragmented sample is dominated by skull caps shaped in a recurring manner; jaws, facial, and interior cranial bones as well as postcranial elements are markedly underrepresented. Owing to the fragmented preservation of the assemblage it is impossible to give a detailed demographic description of the population, but all age classes (from fetal/neonate to senile) and both sexes are present. Cut marks (particularly on the skull caps, less frequently on mandibles and other skeletal elements), rare evidence of burning/heating, and the specific fragmentation of mostly fresh bones refer to a complex death ritual. Scavenger marks are rare and can mainly be attributed to rodents. The frequency of enamel hypoplasia and cribra orbitalia as evidence of individual nutritional crises is low and features are generally not very pronounced. In sum, skeletal remains

from Herxheim do not yield any evidence of a general crisis at the end of the Linear Pottery Culture or of a violent conflict being the origins of the skeletal accumulation.

INTRODUCTION: WARFARE IN THE LINEAR POTTERY CULTURE

Even though crisis and conflict have repeatedly been suggested to present a regular feature of the Neolithic, anthropological and archaeological evidence for this is still relatively scarce. The unambiguous osteological and archaeological identification of war-like events is often problematic (Christensen 2004). The clearest evidence for violent interaction dates to the Early Neolithic Linear Pottery Culture (or Linearbandkeramik; LBK) horizon; whether we can use the term 'war' in this context is still subject to some debate and depends on the varying definitions of war (Peter-Röcher 2007, pp.14–26). As one of the most intensively researched Neolithic cultures (Lüning 1991, p.32), the LBK offers an excellent basis for a more detailed examination of the phenomenon of war and violence in European prehistory.

The end of the LBK has been described for some time as the disintegration of a uniform cultural group, manifested mainly in the increasing regionalization of its ceramic styles (Sangmeister 1983, pp.469–471). The number of enclosures and earthworks appearing towards the end of the LBK period have often been interpreted as defences and used to provide evidence for apparent crisis and conflict during the late LBK (Golitzko and Keeley 2007, pp.336–338); however, in view of more recent investigations of structural features and building techniques (Whittle 1996; Andersen 1997, pp.177–178; Kaufmann 1997), alternative interpretations of these monuments appear more plausible (Jeunesse and Lefranc 1999; Schmid 2004). The discovery of the mass grave of 34 individuals at Talheim, south Germany, including 18, which had suffered fatal cranial injuries and three with projectile injuries (Wahl and König 1997; Wahl and Trautman this volume, Chapter 5) led to a widespread acceptance of the presence of some form of crisis in central Europe at the end of the LBK and transition to the Middle Neolithic. The evidence of substantial violence at Talheim in the form of severe cranial trauma inflicted by axes and adzes even led

some authors to reinterpret the implements used as weapons rather than primarily woodworking tools (Keeley 1996, p.307). In addition to the Talheim mass grave, the remains of 67 violently killed individuals found in the enclosure ditches of the Late LBK site of Schletz near Asparn an der Zaya, Austria, have reinforced the impression that the end of the LBK as a cultural unit was accompanied by violent events. Fatal blunt force traumas to the head recorded in the remains from Schletz indicate a violent event during which the majority of the local population was killed. The only exceptions are young women who, so far, appear to be underrepresented in the assemblage. Traces of extensive carnivore and rodent activity as well as disintegration of the anatomical integrity of the remains suggest that bodies were exposed for some time before finally being placed in the enclosure ditches (Teschler-Nicola *et al.* 1996, 1999; Windl 1996, pp.27–29).

Increasing population numbers and overexploitation of agricultural land, together with climatic and related ecological changes are suggested to have led to an economic crisis that resulted in regional manifestations of violence and conflict at the end of the LBK (Spatz 1998, p.17; Gronenborn 1999, pp.187–190; Peter-Röcher 2007, pp.185–187). Regionalization discernible in local changes to pottery decoration as well as the decline of trading networks that previously guaranteed the supply of raw material for the manufacture of stone tools (Zimmermann 1995) has also been related to the disintegration of the LBK as a cultural unit (Gronenborn 1999, pp.187–190; Farrugia 2002; Beyneix 2007). Conflicts associated with these changes may well have resulted in an increased potential for violence and together with deteriorating neighbourly relations provided the conditions for larger-scale violent events.

The evidence from Talheim and Schletz allows us to recognize a certain degree of violent interaction during the last phase of the LBK; still, it remains to be seen to what extent these larger-scale conflicts are to be viewed as typical. Petrasch (1999, p.510) implies that violence on this scale was a regular occurrence during the LBK. Similarly, Keeley (1996, p.316) suggests that ‘war’ was simply part of LBK life. There is a danger that evidence of the dramatic events at Schletz and Talheim is employed not just for interpretation of the Late LBK and Late Neolithic to Middle Neolithic transition as an essentially violent period but for the characterization of the whole Early Neolithic period as one of ‘general warfare in Europe’ (Wild *et al.* 2004; Golitko and Keeley 2007).

A large number of LBK settlements have been archaeologically investigated and have not provided any evidence for violence. This certainly puts the finds from Schletz and Talheim into perspective. Signs of widespread conflict and violence during the LBK, including its latest phase, are still scarce; despite extensive research, archaeological evidence for violent conflicts during this period has not been fully assembled and available evidence is not easy to interpret.

THE HUMAN REMAINS FROM HERXHEIM

From the time of its initial discovery and earliest phase of excavation, the pit complex at Herxheim has been linked to violent events (Spatz 1998); however, the initial osteoarchaeological investigation of the human remains already refuted this assumption (Haidle and Orschiedt 2001; Häußler *et al.* 2006; Orschiedt and Haidle 2006). An apparent concentration of human skeletal remains together with other archaeological material within individual pits point towards intentional deposition of the remains (Zeeb-Lanz *et al.* 2007).

The human skeletal remains from the 1996–1999 excavations of the Herxheim pit complex show a high degree of fragmentation, especially the postcranial elements, and the cranial vault is overrepresented. The majority of long bones are represented by 2–18-cm fragments. Complete skeletal elements are rare; the most completely preserved elements are the small bones of the hand and foot and the patella. Altogether about 60 000 human bone fragments were retrieved during the 1996–1999 excavations, presenting a minimum of 325 individuals.

The minimum number of individuals (MNI) was based on sex and age assessment of crania or partial crania and calottes (frontal–parietal–occipital combinations) and parietal–occipital fragments as well as burials and partial burials with associated crania (Table 7.1). The actual number of individuals presented by the remains excavated between 1996 and 1999 is probably much higher than 325, as underrepresentation of children, extreme fragmentation, and incomplete representation of individuals within the assemblage affect the MNI.

Within the human bone sample from the excavations during 1996–1999, cranial parts are clearly overrepresented. While at least 319 individuals are represented by the cranium, a markedly smaller num-

Table 7.1. MNI calculations based on cranial remains, burials, and partial burials

	Fetus Neonate	Infans I 1-6	Infans II 6-14	Infans 1-14	Adolescence 14-20	Subadult 1-20	Adult 20-30	30-40	40-50	50-60	>60	Adult 20->60	Indet.	M	F	Indet
Calottes		16	63	39	15	14	3	50	11			211				
Burials			1		1		4	1				1		5	2	1
Partial burials							1	1		1				3		
Crania			2		1		6	2	1	2		2		4	10	2
Refits		1														1
Combinations													80			80
Fetus/neonate	6															6
Age/sex total	6	1	3		2	16	74	43	17	17	3	53	91	12	12	301

Indet., indetermined.

ber of 176 are represented by mandible remains (53 complete mandibles and 123 larger fragments of the right side of the mandible). Fragments of the maxilla ($n = 277$) are found in only slightly more than half of the number of fragments of the mandible ($n = 525$) with similar grades of fragmentation. The example of the pars petrosa of the temporal bone with an MNI of 79 (larger fragments of the right side), a massive bone with good properties for preservation, reveals the degree of parts of the basicranium detached in the process of skull cap production, but lacking at Herxheim. Also markedly underrepresented are postcranial elements and, in particular, small bones such as the patella, and bones of the hands and feet. The MNI based on the clavicle (MNI = 116, based on complete bones, large fragments, and acromial fragments, each of the right side), on the patella (MNI = 47, based on complete left patellae and large fragments of the left side), and on larger foot bones such as the calcaneus (MNI = 47, based on complete right calcanei and large fragments of the right side) and the talus (MNI = 56, based on complete left tali and large fragments) are significantly lower in comparison. The high variability of MNIs based on different elements of the skeleton suggest that individual skeletal parts or partial anatomical associations were brought to the site separately, selectively and, in part, probably already manipulated at a different location.

Age and sex information on the Herxheim skeletal remains is limited due to their particular find context and resulting taphonomic changes, especially widespread fragmentation and disarticulation. As an example, for the calottes, only very broad age assessment based on cranial suture closure was possible (Ferembach *et al.* 1978; Rösing *et al.* 2005), but there is no sex assessment as all sexually dimorphic areas of the cranium were missing.

Apart from the high degree of fragmentation, preservation of the human skeletal remains from the Herxheim pit enclosure is very good. In many cases, it is possible to identify deliberate peri-mortem fragmentation of 'fresh' or 'green' bone, at a stage when the organic component of the bone was still relatively intact. In addition, a smaller number of fragments from Herxheim present with post-mortem breakage patterns that occurred when the organic constituent of the bone had largely disintegrated. Characteristic features of the latter are irregular fracture margins and linear fractures as well as transverse and longitudinal fractures in long bones especially (Polson 1965; Sellier 1971; Maples 1986; Wahl and König 1987;

Merbs 1989; Brückner and Hinze 1991; Ubelaker 1991; Villa and Mahieu 1991).

Besides the high number of long bone fragments, it is mainly the calottes from Herxheim that present with peri-mortem fracture patterns (Figure 7.1). It has to be noted that this kind of fracture pattern differs completely from the intravital trauma observed at Talheim and Schletz, in location as well as in the shape of the traumatic lesions. In addition, the calottes also display a high percentage of elements (56%) with cut marks that indicate removal of adhering soft tissue. These cut marks can often be found alongside or parallel to the sagittal suture, varying in extent, as single cuts, rows of cuts, or mostly as groups of repeated cuts (Figure 7.2). Less frequent are traces of burning, found on only 6% of calottes. These traces of burning on both cranial and postcranial remains are generally very localized and it cannot be excluded that some evidence for heat treatment and burning of remains has been obscured post-mortem by calcified deposits on the surface of some of the bones from Herxheim. Cut marks were also recorded on 14% of mandibles, mainly in the area of



Figure 7.1. A typical skull cap from the Herxheim pit system with peri-mortem fracture patterns and three impact areas.



Figure 7.2. An example of cut marks on a skull cap located in the sagittal area.

the mandibular ramus inferior to the mandibular process and around the mandibular angle. Cut marks in the facial region of the cranium are rare.

The fragmented long bones from Herxheim show an equally impressive pattern of manipulation as the cranial remains described above. Some of the long bones are so fragmented that an exact anatomic identification is not possible despite the observation that the epiphysis were usually removed and are underrepresented in the excavated material. The assemblage is dominated by diaphyseal fragments. Evidence of peri-mortem breakage can be recognized in the large number of spiral fractures recorded. Direct traces of the process of breaking up the remains indicated by impact fractures are infrequent, though it seems plausible that this is mainly the result of preservation due to the high degree of fragmentation in the assemblage. Evidence of manipulation of the remains in the form of cut marks is extremely rare with only 1% of long bones affected. Traces of burning were slightly more frequent and noted on 3% of fragments. Long bones and cranial remains appear to have undergone the same process of manipulation or smashing. With regard to cut

marks, these processes were focused mainly on the cranium, whereas burning appeared to have been applied to the same extent to cranial remains and long bones. Analysis and interpretation of these traces of deliberate manipulation of human remains at Herxheim is ongoing; however, it is clear that cut marks are concentrated on the cranium and therefore related to removal of the scalp. Relatively few cut marks are present near the joints of long bones but as the epiphysis are underrepresented in the Herxheim assemblage this does not contradict the possibility that bodies were divided or cut up.

EVIDENCE OF TRAUMA

Unlike at Talheim and Asparn/Schletz, no definite evidence for unhealed traumatic injuries was noted on the calottes and cranial fragments from Herxheim; only a single individual appeared to have been injured shortly before death. Altogether 11 individuals presented with 15, mostly completely healed traumas (Table 7.2, Figure 7.3). Of these, eight lesions on six individuals affected the external table; in six cases, a depression of the external table and underlying diploe was noted, without any endocranial changes. In addition, one concentric fissure accompanied by periosteal reaction of the external table was present, probably the result of a deep injury to the scalp followed by localized infection. The shapes of the healed defects can be roughly subdivided into two main groups: six defects are circular or slightly oval-shaped, eight can be categorized as extended or pointed oval. The circular and extended oval lesions may affect the external table only or be accompanied by endocranial changes. Only one lesion, probably the result of a scalp injury, can be described as more irregular and rounded.

The latter is one of two healed cranial injuries of the partial burial 282-6-8 and is located on the right parietal close to the lambdoid suture. It consists of a shallow zone of irregular remodelling (2.8×2.3 cm), which indicates complications during the healing process, the only case of this recorded at Herxheim. All other cranial injuries appear to have healed without any inflammatory reactions of the bone or soft tissue.

Table 7.2. Cranial trauma at Herxheim (excavations 1996–1999)

Nr.	Element	Location of trauma	Age	Sex	Comments
282-6-6	Calotte	Left parietal	20–40	Indet.	Depressed, circular, internal bevel
282-6-8	Complete cranium	(a) Left parietal(b) Right parietal	25–30	Male	(b) only external table affected, oval(a) healed scalp injury with reactive bone lesion, irregular
282-14-8	Calotte	2 × Left parietalLeft frontal	30–40	Indet.	(a) Steckschlag, extended oval(b) Depressed fracture, circular(c) Depressed fracture, circular
282-87-15	Front/Par/Occ/Temp	Left parietal	30–40	Indet.	Only external table affected, rounded oval
282-105-13	Calotte	Right parietal	30–40	Indet.	External and internal table affected, oval
282-115-4	Par/Par/Front	Right parietal	>50	Male?	External and internal table affected, oval
281-118-3 V	Par/Occ	Left parietal	40–50	indet.	Glancing blow, external table affected partly removed, extended oval
281-118-5 VIII	Front/Par/Occ	Left parietal	40–50	Indet.	Depressed fracture, displaced break, oval
282-125-2	Front/Par/Occ/Temp/Nas	Right parietal	>60	Male?	Only external table affected, extended oval
282-129-2	Complete cranium	2 × Left parietal (1 × healed, 1 × depressed fissure)	30–40	Male	(a) Only external table affected, diploe compressed, circular(b) Fissure, only external table affected, circular
282-144-6	Calotte	Left parietal	20–30	Indet.	Only external table affected, extended oval

Indet., indetermined; Nas, nasal; Occ, occipital; Par, parietal; Temp, temporal.

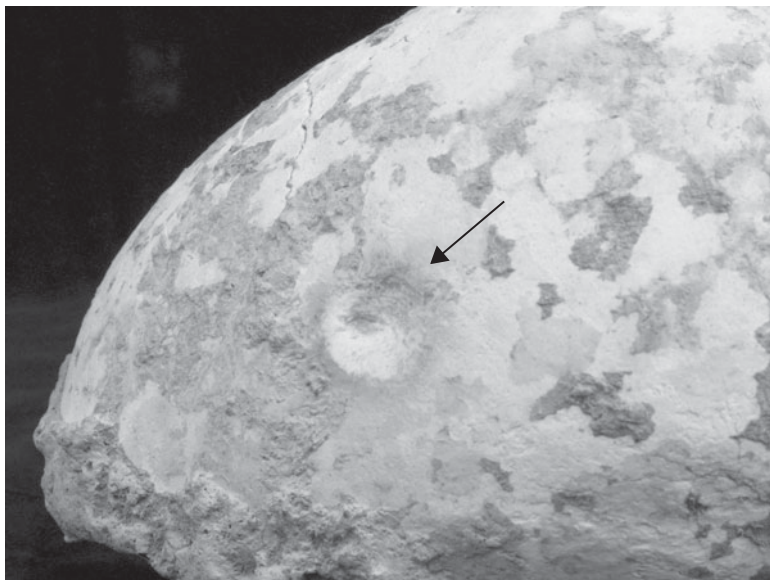


Figure 7.3. An individual with a well-healed impression fracture on the left parietal.

Another case of trauma worth noting was present on the left parietal of the calotte (282-6-6) of an adult individual aged 20-40 years. The lesion is located just behind the coronal suture. Externally, the defect is circular with a diameter of 2 cm, decreasing in diameter towards the internal table, which has been pushed inwards. A computed tomography scan of the lesion showed that contrary to its macroscopic appearance the defect is characterized by internal bevelling. This depressed fracture shows extensive sclerosis and has healed completely.

A further interesting case is present on the calotte of another individual aged 20-40 years (282-14-8). In addition to two circular defects of the left parietal near bregma this individual presented with a pointed-oval defect on the posterior left parietal. Two radiating fractures extend from this defect all the way to the external margin of the element. Based on the shape of the defect it is likely to have been caused by a blow with an adze, which did not fully penetrate but apparently stuck in the diploe. None of the well-healed defects show traces of infection, indicating that these injuries were neither too

severe nor life-threatening but survived for a long time. Nevertheless, we have to be aware that injuries to the head like these might cause further complications, which do not show bony reactions. A more detailed forensic analysis of all cranial traumas at Herxheim is ongoing (see Orschiedt *et al.* 2003, 2006).

Without exception all individuals affected by cranial trauma are adults: two could be aged at between 20 and 30 years, four at 30–40 years, one at 20–40 years, two at 40–50 years, one over 50 and another over 60 years. Only two individuals with head trauma presented with crania complete enough for sex assessment and both were male. Two other cranial fragments were sexed as possibly male; the remaining individuals with cranial trauma could not be sexed due to incomplete preservation. The majority of injuries (10) appeared to be located on the left parietal, whereas only three traumatic lesions were on the right. In addition, one defect was present on the left frontal and another on the right coronal suture.

In addition to traumatic lesions the widespread occurrence of a variety of pathological conditions that indicate nutritional deficiencies or diseases can give further indications of a potential (economic) crisis within a population group (Haidle 1997). As the skeletal remains from Herxheim were extremely fragmented many of the relevant indicators such as Harris lines (lines of increased bone density caused by growth disturbance) or living stature could not be recorded. Many deficiency diseases manifest primarily during the growth and development phase of childhood and adolescence, an age group that was underrepresented in the skeletal assemblage. The skeletal remains at Herxheim were potentially assembled over some time. Because it is not clear whether they represent a regionally and temporally defined population or, like the ceramics at the site, originated from regions farther away or even older phases of the LBK, it is hardly possible to make conclusive statements regarding a potential economic crisis at the end of the LBK. Despite limitations of the assemblage it is worth noting that indicators of physiological stress occur infrequently and in their less severe form only (e.g. cribra orbitalia, a porotic expansion of the diploe of the orbital roof, frequently associated with anaemia (see Stuart-Macadam 1987; Wappler *et al.* 2003) and enamel hypoplasia (mineralization defects of the enamel during development; see Goodman and Rose 1991)).

CRISIS? WHAT CRISIS?

Results of the osteoarchaeological analysis of the Herxheim remains to date do not support the idea of a crisis at the end of the LBK—evidence for physical violence is limited to a small number of healed cranial injuries and the prevalence of deficiency diseases in the subadult population is very low. What the results of the analysis do show is extensive evidence for manipulation of the remains in the form of deliberate fragmentation and traces of burning, in particular, indicating systematic shaping and processing of the cranial remains, as well as the removal of soft tissue. These actions have to be viewed as part of a complex multiphase mortuary rite during the final phase of the LBK. Consideration of individual cases of manipulation shows that despite a general system of processing and shaping the bones there was some diversity in how this process was carried out—a relatively uniform procedure characterized by individual variation.

Archaeological evidence, in particular, the presence of imported ceramics at the site, suggests that depositions at Herxheim from other regions of the LBK distribution were not limited to pottery (Zeeb-Lanz *et al.* 2006, pp.74–75) but probably also included the human skeletal remains associated with it. It is therefore unlikely that skeletal remains from Herxheim represent a homogeneous population group. The fact that damage to the remains includes peri- and post-mortem breakage that occurred when bone was still relatively fresh implies that the remains could have previously been buried elsewhere, exhumed, and then manipulated and deposited at Herxheim. A definite temporal attribution of the complete skeletal assemblage to the late LBK is therefore not possible.

VIOLENCE ON THE LIVING, VIOLENCE ON THE DEAD: MASS CANNIBALISM AT HERXHEIM?

After submitting this chapter, a different view on the Herxheim material was presented by Boulestin *et al.* (2009). As there are various discrepancies in interpretation of the site between this publication and our own results, we were given the opportunity to add some further comments on this. Boulestin *et al.* (2009) postulate a case of

mass cannibalism for Herxheim based on a single deposit or concentration (deposit 9) from renewed excavations in 2005–2008, consisting of 1906 isolated human remains. We strongly contradict this view based on a study of more than 60 000 human remains from the older excavations of 1996 to 1999.

There is not just one way of treatment of human remains at Herxheim. Zeeb-Lanz *et al.* (2007) report on the detailed archaeological and osteological analysis of eight find complexes with human remains that revealed a large diversity of depositional patterns present at the pit system of Herxheim (this article was not discussed by Boulestin *et al.* 2009). There is no single deposit or concentration that shows a similar distribution of skeletal elements. The preservation of bones is also highly variable; it differs from a few cases with more or less complete bones or bones with larger portions intact to highly fragmented pieces beyond the possibility of an accurate anatomical description. The larger part of the sample, however, reveals a high rate of fragmentation on human remains with the majority of 90% of long bone fragments within 2–8 cm.

Representation of anatomical parts is highly selective at Herxheim and strongly dominated by skull fragments. The highest MNI comes from skulls, or skull vaults as well as parietal–occipital fragments representing at least 319 individuals. The significant lack of mandibles (MNI = 176) and more so the lack of basicranial parts (MNI of the right pars petrosus of the temporal bone = 79) are not explained by the cannibalism hypothesis. Both bones are generally very well preserved and not likely to be completely chewed and swallowed. With excellent bone preservation at the site, we think it is plausible that manipulation of the skulls and dismembering of the mandibles took place at either a distant place or these fragments were not deposited in the pits. The smashing of the skull was probably not carried out ‘perhaps to extract the brain’ (Boulestin *et al.* 2009, p.976) but to produce the specific skull caps, which were uniformly shaped (Orschiedt and Haidle 2006). The pattern of smashing displayed here makes no sense for extraction of the brain, as there are more efficient ways to open the brain case. Human-induced breakage and abundant defleshing (Boulestin *et al.* 2009, p.977) has been reported previously (Haidle and Orschiedt 2001; Häußler *et al.* 2006; Orschiedt and Haidle 2006, 2009; Zeeb-Lanz *et al.* 2006, 2007, 2009) but they are not sufficient proof of cannibalism.

Postcranial elements are markedly underrepresented as well, particularly the small bones such as patellae, bones of hand and feet, vertebrae, ribs, etc. The remark 'The distribution of the skeletal parts is very different from that observed in funerary or scavenged assemblages' (Boulestin *et al.* 2009, p.976) is true indeed, but this does not necessarily have to be explained by cannibalism. It is evident that a selection of skeletal elements had taken place before the deposition of processed bones in the pit system. This shows that more or less complete bodies might be dismembered, disarticulated, and smashed but the remains were not deposited in their entirety. This fact is not proof for cannibalism.

As mentioned before, the human remains of Herxheim show various signs of manipulation. Cut marks are present on 56% of the skull caps and 14% of the mandibles (especially on the processi and the angulus mandibulae), but only very few on facial bones. Cut marks on long bone fragments are present with a frequency of only 1%. Boulestin *et al.* (2009, p.976) give no further information except for noting 'the presence of scrape marks in the marrow cavity on two fragments'. Unfortunately, there is no further evidence or photographic documentation of this previously unknown kind of manipulation at the site.

Surprisingly, any details on the number of burnt bones is lacking in Boulestin *et al.* (2009). According to our studies, signs of burning in a spot or stripe-like appearance are present on 6% of the skull caps and 3% of the long bone fragments with signs of heat influence. An interesting pattern is revealed by the fact that several mandible and maxillary fragments show signs of burning in the area of the teeth, the crowns are cracked or missing with the bones exhibiting a dark brown or black colour. According to our interpretation together with a concentration of signs of burning on the bodies of the mandibles and the occipital bones this might indicate an activity that includes putting the skulls (or heads) in the fire before smashing bone for cleaning them of soft tissues. There are no completely burnt bones present in the assemblage. As the colour of the burnt fragments ranges between dark brown (with or without cracking of the bone surface) and black, this reveals either a very short contact with fire of higher temperature or a longer duration with a moderate temperature of about 300 °C. This pattern might be created by contact with hot ashes or embers.

The occurrence of a few chewing marks were also reported before but cannot be definitely associated with human gnawing (Boulestin *et al.*

2009, p.977). Although it is known that humans are able to damage bones with their teeth (Maguire *et al.* 1980, p.88), there are few detailed descriptions available to distinguish human bite marks from those of dogs or other medium-sized carnivores (White 1992, pp.155, 334–335). Recently, however, an article by Fernández-Jalvo and Andrews (2011) has proposed a differential diagnosis to identify human chewing on bones.

In conclusion, based on the facts presented it seems impossible to prove mass cannibalism. Any hint of killing of hundreds or even more than 1000 individuals found at Herxheim is missing. There is evidence of disarticulation and defleshing activities at Herxheim as well as in other Neolithic sites. Although the frequency and location of cut marks on the faunal remains from Herxheim were not included in Boulestin *et al.* (2009) and are not available to the authors, it seems there are some general discrepancies between the treatment of human corpses and butchered animals in general. One of the most striking differences is the very few cut marks (1%) on the long bones and other postcranial elements (below 1%), the most 'meaty' parts. The faunal remains at Herxheim (Zeeb-Lanz *et al.* 2007) support a ritual background to the depositions instead of a dietary interpretation of the human remains. Arbogast (2009, p.53) clearly differentiates composition of faunal concentrations in the pit enclosure from the animal remains in the settlement context:

The bone remains from the pit enclosure differ from the animal bones in the settlement pits regarding the represented species and the proportion of the quantities. The most remarkable deviation in the pit enclosure applies to the occurrence of dog, to which a little more than 200 marginally fragmented bones can be assigned. These belong to at least six animals represented either by segments of skeleton still in interconnection or by complete carcasses. Other features are foot bones of bovines and small ruminants, mandibles of little wild carnivores and the remnants of wings from a bird (goose or crane). All these animal relics characterize the singularity and special importance of the fauna from this pit enclosure.

In our opinion, it is impossible to develop the idea of a ritual mass cannibalism scenario on this basis. In general, the consumption of human meat cannot be proved by disarticulation and dismembering activities. How likely can it be that spongy bones were chewed and marrow extracted if the reason for cannibalistic actions is not survival?

However, Herxheim is interpreted by Boulestin and others as similar to Fontbrégua (Villa *et al.* 1986a,b), a site that is quoted as ‘Today, the only convincing case for the concerned period is Fontbrégua, even if the detailed study of this assemblage remains unpublished’ (Boulestin *et al.* 2009, p.977). However, as a complete and detailed analysis is still missing there are serious doubts if Fontbrégua can be seen as the remains of a cannibalistic feast or better as evidence of secondary burial rites (Orschiedt 1999, pp.75–77; Mafart *et al.* 2004).

The scenario described by Boulestin *et al.* (2009, pp.979–980) for the socio-economic situation at the end of the LBK is highly debatable. In our view, there are no general signs of intensive warfare or economical crises. This conclusion is based on a generalized and simplistic view (Orschiedt and Haidle 2009, pp.49–50). To evaluate better the changes at the end of the LBK, remains from earlier phases have to be carefully restudied, because there is evidence that the LBK was not the uniform cultural complex that it is always portrayed as.

The evidence presented by Boulestin *et al.* (2009) for deposit 9 does not yield much new information other than that presented before for material from excavations 1996–1999 and from deposits 1–8. Their interpretation as evidence of mass cannibalism and even possible killing of individuals is not convincing and fails to disprove the secondary burial hypothesis. It neither gives a general interpretation of the selective representation of human and faunal remains as well as ceramic and stone artefacts in the pit enclosure, nor does it explain the ritually motivated activities at the site of Herxheim. The material basis is explained better by a very complex treatment of human bones and bodies within a system of burial rites. The consumption of human tissue within the ritual complex cannot be completely excluded, yet there is insufficient proof. And cannibalism as the main explanation for the very special and diverse composition of the Herxheim finds leaves many questions unanswered.

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Violence in the Single Grave Culture of northern Germany?

Gundula Lidke

ABSTRACT

Several skeletal individuals from northern Germany with evidence of modification, mostly in the form of trepanation, less frequently in the form of trauma, can now be securely dated to the Single Grave Culture. These cases are described here and analysed. A discussion of age and gender of the individuals concerned, as well as of burial customs and grave furnishings places these cases within the cultural context of the period. Results are then compared with findings from the Corded Ware Culture.

INTRODUCTION

The Single Grave Culture (approximately 2800–2200 cal BC) forms the later part of the Neolithic in northern Europe. It is closely related to the Corded Ware Culture and is mainly characterized by different types of battle axes, which give it a rather martial appearance. However, it is still not known to what extent violence did really play a role in this cultural group. Skeletal material is rarely preserved in some areas, and in other cases, its exact chronological background is unclear. Yet some cases of skulls with traces of trepanation or traumas are known from Mecklenburg-Vorpommern, Schleswig-Holstein, and Lower Saxony (Figure 8.1). Some years ago, several skulls from



Figure 8.1. Cases of manipulated skulls from the Single Grave Culture from northern Germany mentioned in the text.

Mecklenburg-Vorpommern with evidence of manipulation were directly AMS-dated (Terberger and Piek 1997; Lidke and Piek 1998, p.58). Some of them, which were previously thought to belong to the Globular Amphora Culture, date to the late Single Grave Culture. They were found in megalithic graves and exhibit interesting and spectacular cases of trepanations.

THE SITES

Kruckow, Mecklenburg-Vorpommern

The megalithic grave ('Großdolmen') of Kruckow was excavated in 1969 (Hollnagel 1970). Among the skeletal remains were three skulls with trepanations (Kruckow 1, 2, and 3). Previously, these were thought to belong to the Globular Amphora Culture. This interpretation went back to the excavation of trepanned skulls in Globular Amphora graves at Ketzin, Lkr. Havelland, Brandenburg (Ullrich

1971). As ceramic finds from the Kruckow megalithic grave include material from the Funnel Beaker Culture (during which the grave was constructed), unspecific 'Middle Neolithic' pottery (interpreted as Globular Amphora material) as well as two vessels from the Single Grave Culture and no direct datings were available at that time, the skulls (and with them the phase of occupation of the grave seen in findings), based on analogies with discoveries from Ketzin, were assigned to the Globular Amphora Culture. Furthermore, no cases of trepanation from the Single Grave Culture were known, and no connection was made to several cases from the Corded Ware Culture from central Germany. Over the following years, this hypothetical dating was not questioned. Therefore, it was more than a bit surprising when AMS dating showed two of the trepanned skulls to be of a Single Grave Culture age.

- Kruckow 1 (Figure 8.2) is the skull of a child (infans II: 7–12 years), which was found among a concentration of finds in the northeastern part of the chamber. The skull shows a trepanation of 40×80 mm along the midline of both parietal bones. Cut marks around the opening are visible traces of the operation technique. This area of the skull is a dangerous one to trepan, because a major blood vessel (i.e. the sinus sagittalis superior) can easily be injured. This may actually have happened in the case of Kruckow 1, as the diploe between the outer and inner table of bone is open and there are no signs of healing. The skull dates to 2190 ± 129 cal BC (3800 ± 75 BP, UZ-4087).
- Kruckow 2 (Figure 8.3) represents the skull of an adolescent woman. It was found near a cluster of several ceramic vessels and fragments of human bones in the western part of the chamber. Here a trepanation of 42×32 mm is visible on the left parietal and occipital bone. Again, cut marks are observable around the opening, but the diploe is partly closed, so the trepanation must have been survived for at least a short time. This skull dates to 2371 ± 98 cal BC (3905 ± 70 BP, UZ-4086).
- A third trepanned skull from this grave (Kruckow 3, described and depicted by Grimm 1983; the skull of a mature man with a healed trepanation on the left parietal) now appears to be lost. A bone fragment catalogued under the skull's inventory number could be dated to 3056 ± 146 cal BC (4435 ± 65 BP, UZ-4122). This date, however, should be taken with care, as it is not clear

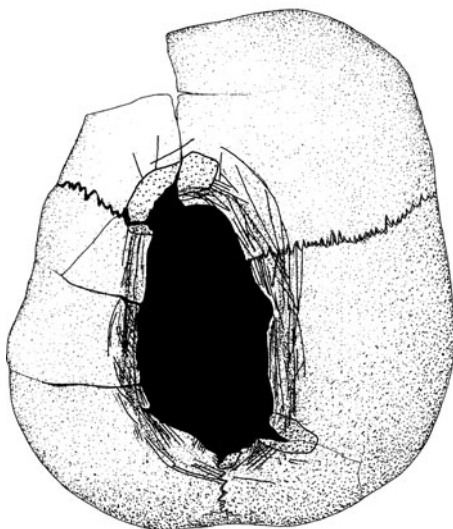


Figure 8.2. Kruckow 1, Mecklenburg-Vorpommern: skull with trepanation and visible cut marks. Drawing: M. Wiczorek.

whether the fragment really belonged to the trepanned skull. On the other hand, this skull lay relatively isolated in the northeast corner of the chamber without any associated finds (Figure 8.4). In addition, there is at least one other case of a trepanation from about 3000 BC in Mecklenburg-Vorpommern (a skull from Liepen, a plagiocephalic skull of an adult man with traces of a non-penetrating, healed surgical intervention on the back part of the parietal bones, dated to 2972 ± 91 cal BC [4340 ± 75 BP, UZ-4089], cf. Lidke and Piek 1998, p.64). Therefore, it is actually possible that an older manipulated skull was found in this chamber and deliberately left where it was by Single Grave Culture individuals, when they were interring skeletal material of their own. If this is true, then there is a double horizon of depositions of trepanned skulls in the Kruckow chamber, with trepanations taking place in the Globular Amphora Culture or Funnel Beaker Culture respectively as well as in the Single Grave Culture.

The find material from the megalithic grave corresponds well with dates obtained for the manipulated skulls (Lidke 1999). Remains of

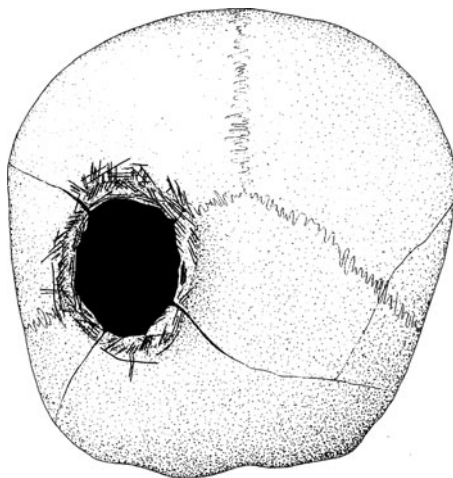


Figure 8.3. Kruckow 2, Mecklenburg-Vorpommern: skull with trepanation and visible cut marks. Drawing: M. Wiczorek.

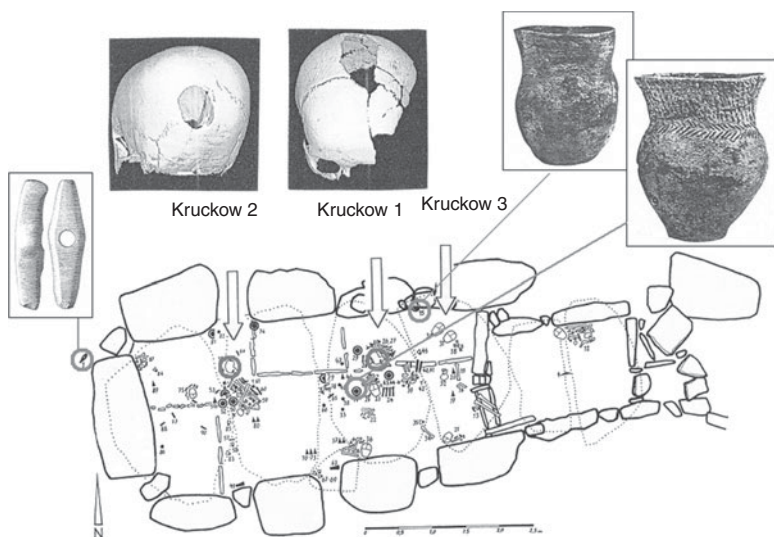


Figure 8.4. Kruckow: plan of megalithic chamber with trepanned skulls and Single Grave Culture material. Plan modified after Hollnagel (1970).

ceramic vessels show use of the grave during the Funnel Beaker Culture, and possibly the Globular Amphora Culture. Two beakers and an axe (Figure 8.4) document use during the time of the Single Grave Culture. The decoration of the beakers points to a later date in the chronology of the Single Grave Culture, and the axe represents a younger type. These findings are in agreement with the skull's dates, which indicate a late phase of the Single Grave Culture. The beakers and axe may thus well represent the horizon of deposition of two manipulated skulls in the Kruckow megalithic burial chamber.

Serrahn, Mecklenburg-Vorpommern

Another modified skull was found in the megalithic grave ('erweiterter Dolmen') of Serrahn (Figure 8.5), which was excavated in 1965 (Schuldt 1965). Again, several disarticulated skeletal remains were found, together with some flint and bone artefacts and pottery. The

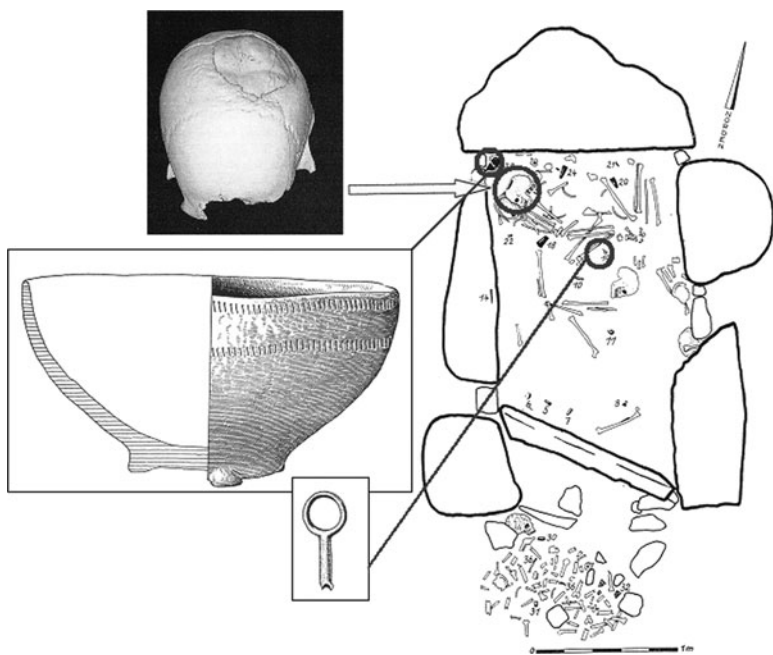


Figure 8.5. Serrahn, Mecklenburg-Vorpommern: plan of megalithic chamber with trepanned skull and late Neolithic material. Plan modified after Schuldt (1965).

modified skull was that of a mature man. It shows a trepanation of 90×65 mm along the midline of both parietal bones, with the greater part on the left parietal. Again, this trepanation is situated in the area of the sinus sagittalis superior, but the diploe is closed, so the operation was obviously survived for at least some time. The skull can be dated to 2304 ± 110 BC (3845 ± 70 BP, UZ-4085), and the date points once more to the younger phase of the Single Grave Culture. Among the finds from the chamber, a bowl and a bone pendant may represent Late Single Grave Culture material, which would correspond well with the date obtained for the skull.

Groß Upahl, Mecklenburg-Vorpommern

A skull fragment from Groß Upahl, probably that of an adult man, shows a healed depressed fracture of 28×33 mm in the back of the right parietal bone. The fragment was found in a deposit of closely packed secondarily buried human skeletal remains, mostly skulls and long bones. Pottery shards and arrowheads found between the bones again indicate the late Single Grave Culture (Just 1960; Lidke and Piek 1998, p.82).

Hasbergen, Lower Saxony

When a Single Grave Culture barrow at Hasbergen near Osnabrück was excavated, two skeletons were discovered, lying antipodially in a wooden burial chamber, and both furnished with beakers as well as flint daggers and flat axes. Skeleton 2 was very poorly preserved. Skeleton 1, that of a man, had additionally been given a breast ornament made of boar tusks. Grave type and furnishings indicate an older level of the Single Grave Culture (Schlüter 2000).

The skull of skeleton 1 shows a trepanation with a dimension of 45×45 mm, situated on the front of the right parietal bone (Figure 8.6). The diploe between the inner and the outer table of the skull is partly visible, but there are also indications for bone growth and therefore healing, so the operation was survived for some time. There was also a well-healed fracture in the skeleton's right ulna and radius, which is probably older than the manipulation on the skull.



Figure 8.6. Hasbergen, Lower Saxony: trepanned skull from inhumation grave. Photo: G. Lidke.

Nebel, Schleswig-Holstein

A skull of a young adult, probably male, found in a megalithic grave near Nebel on the isle of Amrum (Schäfer 1958, 1965) shows several interesting lesions. In the middle of the frontal bone is a circular opening with a diameter of 28×25 mm and very steep walls without internal bevel (Figure 8.7). The diploe is completely visible, and there are no healing reactions. It is still open to discussion whether this lesion could be interpreted as a trepanation. Unfortunately, there is also recent damage on the surface of the skull, but the colour of the bone in these parts is lighter than that seen on the edges of the lesion. If it is indeed a trepanation, it must have been performed by some kind of hollow drilling; this possibly occurred post-mortem. Similar trepanations are reported for Pre-Columbian skulls from Mexico (Stone and Urcid 2003).

Another lesion of approximately 40×25 mm is visible on the left parietal bone (Figure 8.7); the walls are sloping on the inner bone

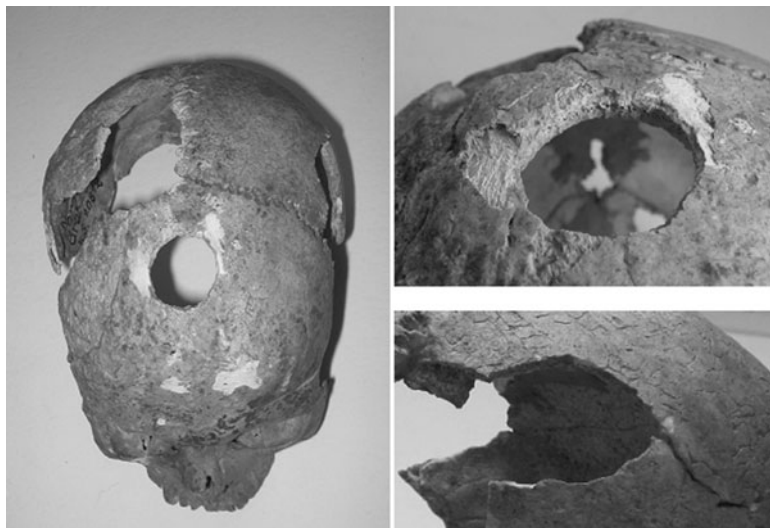


Figure 8.7. Nebel, Schleswig-Holstein: manipulated skull from megalithic grave. Frontal lesion (with detail): trepanation?; lesion in the left parietal bone. Photo: G. Lidke.

table and there is a possible fracture line 25 mm in length. This lesion may well represent a trauma. Furthermore, there are two small rhomboid lesions, one on the back of the left parietal bone, the other on the occipital bone (Figure 8.8). The former, measuring 15×13 mm, affects the outer table of bone only, whereas the latter, with 20×13 mm of similar size, represents a penetrating lesion, again with sloping walls on the inner table of bone and a possible fracture line. Both might be caused by the same implement or weapon. There are no signs of healing in any of these lesions.

The skull was found together with a few other cranial remains and further remains of disarticulated skeletal material as well as undistinguished pottery from the Middle Neolithic. A flint dagger and arrow-head indicate Single Grave Culture/Late Neolithic use of the burial chamber. Again, an AMS date of 2576–2506 cal BC (4005 ± 28 BP, KIA 17089) obtained for the manipulated skull points to the Single Grave Culture, indicating a slightly older horizon than that of skulls from Mecklenburg-Vorpommern.

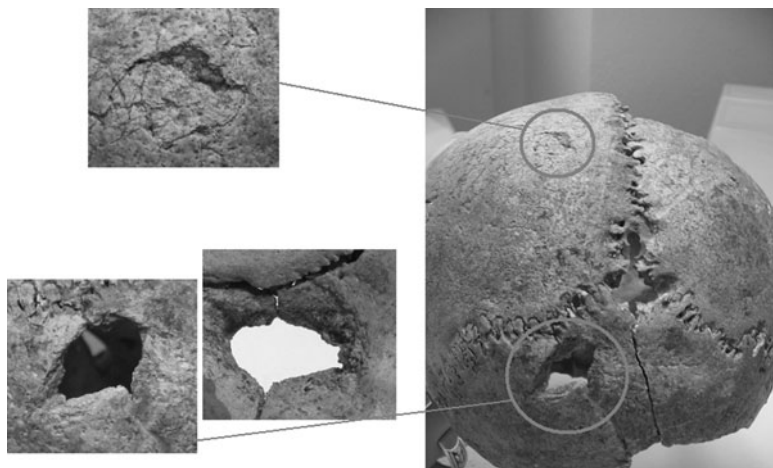


Figure 8.8. Nebel, Schleswig-Holstein: manipulated skull from megalithic grave. Lesions in the left parietal and occipital bone. Photo: G. Lidke.

DISCUSSION

Usually—as the name implies—single inhumation graves are seen as the typical form of burial for the Single Grave Culture. Remarkably, most of the manipulated skulls described here were not found in single graves, but come from megalithic chambers where they were discovered as disarticulated remains in secondary burial situations. Only Hasbergen represents a more ‘typical’ burial, but in this case we see a special situation again: a double burial with exceptional furnishings.

Single Grave Culture ceramics and stone artefacts have been found quite regularly in megalithic graves in Mecklenburg-Vorpommern (Jacobs 1991). However, until the recent radiocarbon dates were obtained no skeletal material from the burial chambers had been assigned to this cultural group. Now, secondary burial appears as a regular feature of the Single Grave Culture, and there is the question of how many other skulls or skeletal remains found in megalithic graves might also belong to it. Furthermore, it can be asked whether secondary burial in megalithic chambers reflected some kind of particular status of the buried individuals. However, manipulated

skulls from Mecklenburg-Vorpommern or Schleswig-Holstein were not directly associated with special furnishings. Maybe in these cases megalithic chambers were used to dispose of the 'dangerous dead'?

Individuals with skull manipulations are mainly identified as adult males, except for Kruckow, where a young woman and a child are represented. As a whole, there are more trepanations than traumas, although it can be suspected that in some cases surgical intervention may have followed in the wake of trauma due to violence. Trepanations were mostly survived, even if in some cases only for a short period. The skull with unhealed lesions from Nebel probably represents a special case. Perhaps here a bone disk was taken from the skull of an individual killed by violence?

Chronologically, the skulls date to the middle and later period of the Single Grave Culture, from about 2500 to 2200 BC. One could imagine the later phase of the Single Grave Culture to have been more violent than the early one, but the total number of cases and dates are too few to draw such conclusions, especially in view of the fact that early Single Grave Culture material is generally rare.

So how do the Single Grave Culture cases fit into the greater cultural pattern of the time? For a general study of violence in German Neolithic, cases of manipulated skulls from the Corded Ware Culture have been recorded in the literature (Lidke 2005). The majority of skulls (32) were male; women had only been affected in six cases. Interestingly, only one female skull showed a trepanation, which is described as a surgically treated head wound (Wahl *et al.* 1991). Five other women had suffered traumatic lesions, of which three did not survive. In men, on the other hand, trepanations and traumas appear to be more balanced (24 cases of trepanations, 14 of traumas; some individuals suffered both). Astonishingly, only in two trauma cases did the individuals not survive. Violence in the Corded Ware Culture thus seems to be closely related to males and on a mostly non-lethal scale whereas women seem to have been rarely affected, but if so, with harsher consequences. Burial customs varied; some individuals with head lesions were buried with normal grave furnishings, others were interred without furnishings, and even cremation burial occurred.

A mixed picture emerges, into which cases from the Single Grave Culture fit very well. Violence, traumas, and trepanations in the Late Neolithic—as in the Neolithic as a whole—seem mostly to belong to the world of men, but treatment of individuals who had experienced

skull manipulations was by no means uniform. Years ago, a Late Single Grave Culture double burial was excavated in Ziesendorf, Mecklenburg-Vorpommern (Nilius 1967). Two individuals lay antipodally in a stone packing grave, one of them in an extremely crouched position, with the skull placed unnaturally in the area of the ribs. Both skulls appeared to have been 'smashed', so perhaps this burial may have represented another example of victims of Single Grave Culture violence. Unfortunately, skeletal remains were reburied after excavation and thus not available for scientific study. It is to be hoped that new discoveries will further help to answer questions concerning violence in the cultural context of the Late Neolithic.

Injured—but special? On associations
between skull defects and burial treatment
in the Corded Ware Culture of
central Germany

*Jörg Wicke, Andreas Neubert, Ronny Bindl,
and Horst Bruchhaus*

ABSTRACT

We compared the burial contexts of 21 individuals showing skull defects with 149 (as far as we know) unharmed individuals from the Late Neolithic Corded Ware Culture of central Germany. The typical burial customs such as the sex-dependent positioning, structure of cemeteries, grave construction, and number and type of grave goods could be sketched and an overall special treatment of the injured group excluded. None the less, some peculiarities could be outlined. Lesions occur more often in older (mostly mature) individuals than would be expected from the overall age distribution, which is interpreted as accumulated risk—the longer somebody lives, the higher the probability of becoming injured. The lesions further concentrate in males; this could be explained with universal heightened aggressive behaviour in human males, and together with the suspicious co-occurrence between skull defects and stone items in the burial, in particular, ‘battle’ axes, points towards a rather concrete connection between the weapon and the biography of the deceased. We therefore seem to get one step closer to Fischer’s (1956, p.140) proposed warrior-like, axe-carrying élite.

INTRODUCTION

Traumatic skull injuries of the central German Corded Ware Culture (CWC) have long been a topic of scientific investigations. There was an intensive period of investigation during the 1960s (Ullrich and Weickmann 1963; Behm-Blancke 1964; Károlyi 1964). A second period of investigations was initiated at the end of the twentieth century, including those by an interdisciplinary research team in northeast Germany (Lidke and Piek 1998; Lidke 2005). In previous papers, individual case studies have presented research into historical aspects and actualistic comparisons with modern forensic cases (see Bruchhaus *et al.* 2006a for further references).

It was not until recently that scholars began to include the wider archaeological context into investigations of cranial trauma (Lidke 2005, 212 ff). Following on from this approach, we will try to place the injured individuals within the context of the local CWC by comparing individuals with skull lesions with a group of unharmed individuals regarding grave structures and contents. We focused on skull lesions, because this is the only group of defects that has been thus far examined systematically for this period.

CENTRAL GERMAN CORDED WARE CULTURE
(SCHNURKERAMIK)

The CWC in the broader sense forms, together with some related cultures and groups (e.g. Single Grave Culture, Boat Axe Culture, and Fatyanovo Culture), a cultural complex of the Late Neolithic known as the 'Battle Axe Cultures'. Objects attributed to these groups have been excavated in northern, eastern, and central Europe, ranging from Finland to the upper Danube and Switzerland, and from the Netherlands to the upper Volga.

Strictly speaking, the European mainland groups are considered as CWC. The central German CWC forms a characteristic and material-rich regional group within this wide-ranging cultural complex. With about 1500–2000 graves from over 750 findspots, it is one of the most abundant archaeological cultures in Europe. The distribution is

situated mainly in the lower and middle Saale region enclosing the Harz Mountains (northern and eastern foreland of the Harz, 'Goldene Aue', and Thuringian Basin). Smaller centres are in the valley of the River Elbe around Riesa/Dresden as well as in the Upper Lusatian region with a local group of its own (Bertram 1994).

According to recent ^{14}C data (Dresely and Müller 2001; Müller J. 2001, pp.63–67; Furholt 2003, 42 ff), the central German CWC spans between approximately 2700 and 2000 BC. At the beginning of its development, the CWC had contact with the Globular Amphora Culture and at the end with the Bell Beaker Culture as well as with the Early Bronze Age Uneticean Culture. Though the available ^{14}C data pinpoint several graves regarding their absolute chronological position, the overall chronological sequence of the CWC is still under discussion (Fischer 1956, 109 ff, 1958, 258 ff; Buchvaldek 1986; Hein 1987, p.164; Stock 1997; Müller J. 2001; Furholt 2003, 42 ff).

Despite its abundance, the central German CWC is almost exclusively known from graves and stray finds, whereas settlement evidence is extraordinarily scarce. Large cemeteries were not common in the CWC, graves lay rather isolated or in small groups of two to four. In rare cases with assemblages of more than 10 graves (such as Braunsdorf or Schafstädt, both Saalekreis), the burials tend to accumulate in small and dense clusters with unused space in between, or were spaced more than 10 m apart from each other. Both phenomenon could be interpreted as signs for once existing burial mounds—but even then, it remains uncertain whether we are looking at one large systematic cemetery (of one community/kin group) or at a rather random accumulation of the common isolated graves and small grave groups (possibly of different kin groups). The fact that most of the burial sites are not completely excavated and documented adds to this uncertainty. Further, the secondary use of older barrows, particularly those of the Baalberge Culture, occurred.

Though multiple burials, usually with two individuals, are common, single inhumation graves dominate the CWC funeral rite. In addition to simple pits, graves occur with a stone (flagstones, cists, stone packings, wall chamber graves) and timber construction. The deceased were typically deposited in a crouched position on their backs with flexed arms and legs (*Rückenhocker*) with strictly a sex-differentiated side position and orientation. Women were crouched on their left side in an east–west orientation with the

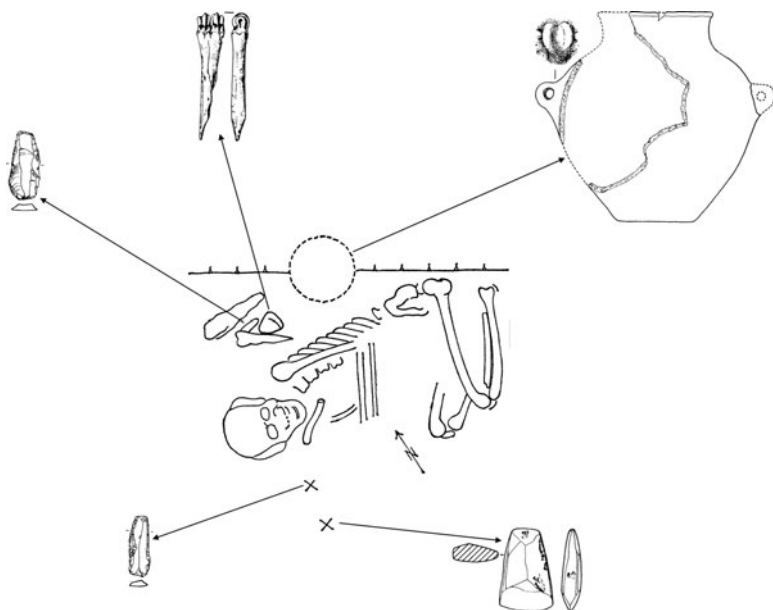


Figure 9.1. Male single burial from Muschwitz (no. 14) with typical CWC grave goods. All goods in the same scale; original height of the amphora: 20.2 cm (after Matthias 1985, fig. 5e, Taf. 85/2–6).

head to the east, whereas men were crouched on their right side, and west–east orientated (Figures 9.1 and 9.2).

The main ceramic types in CWC graves are amphorae and beakers (together approximately 80% of the total amount of ceramics). Pots, cups, and bowls occur less frequently. The main pottery ornaments are the eponymous cord imprints and parallel, incised lines. Whereas ceramics and flint, as well as bone tools, are common in graves of both sexes, some objects are strongly sex dependent. The characteristic stone axes with shaft holes, occasionally with a faceted surface and often referred to as ‘battle’ axes and status symbols, occur almost exclusively in male graves. Flat axes, chisels, and maceheads also belong to the CWC repertoire of polished stone items and are again restricted to male burials. The male package is completed by sheets made of split boar tusks (*Eberhauerlamellen*), mostly drilled. In contrast, some objects are exclusively found in female burials. Drilled canid teeth, shell disks, and small copper items (beads,

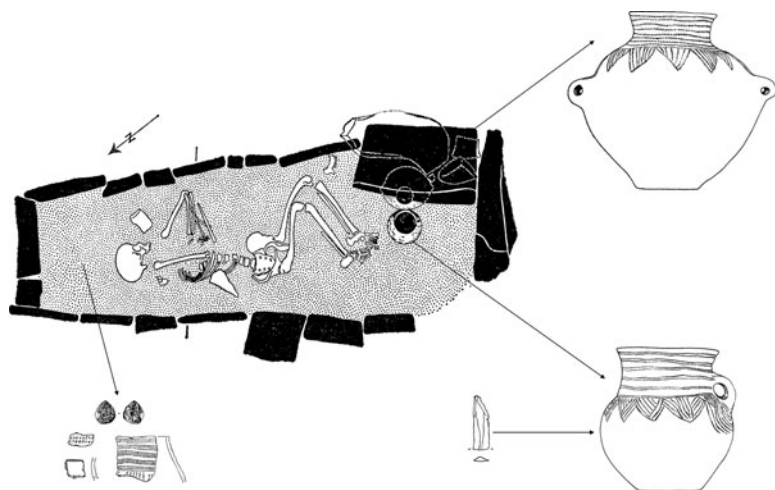


Figure 9.2. Female single burial from Bad Lauchstädt, OT Schafstädt, Fpl. 9, grave 10 with typical CWC grave goods and stone cist. All goods in the same scale; original height of the amphora: 22.5 cm (after Matthias 1982, fig. 38a, Taf. 94/3–9).

ringlets) occur in female graves, sometimes in large quantities. All these sex-dependent items appear sometimes combined, sometimes isolated, but are overall rare and restricted to fewer than about 20% of the burials.

The clear sexual subdivision of the burial rite on one hand, and scarcity of some kinds of grave goods on the other, encouraged theories about social differentiation in the CWC quite early on. Behm-Blancke (1989, 122 ff) explained the dichotomy between male and female burials in an extensive structuralistic approach. Fischer (1956, p.140) assumed axe burials to be a sign of a warrior-like élite, whereas women with canid tooth ornaments belonged to a distinguished social stratum. None the less, the range in burial customs is not as broad as in the following Unetice Culture and therefore suggests rather moderate social stratification in smaller, probably kin-based communities (Siemen 1992; Bruchhaus *et al.* 2002). However, Heyd (2004, p.192) points out that the most precious finds—among them copper axes of up to more than 3 kg per piece (cf. Kibbert 1980, 35 ff)—never appear in graves but only as stray

finds and in caches or placed deposits. In addition, he implicitly suggests this reveals an outstanding leading class, and therefore a more considerable social stratification than the burial rite depicts.

MATERIAL AND METHODS

Of a total of about 30 CWC individuals in the Jena Collection carrying different marks of cranial lesions (which equals 3–4% of the examined skeletal population to date), we chose 21 individuals for which grave contexts are known. The diagnosed lesions include different large perforations (round or oval) and discrete (superficial) lesions on the neurocranium. For the origin of all of these lesions an exterior mechanical cause, hence an impact, is likely.

A list of these graves is given at the end of this chapter. Where they are mentioned in the text, a reference number according to this list is provided. Most of the defects have been rechecked in the Jena Anthropological Department, but information regarding three defects has been drawn from the literature only (nos 4, 8, and 15).

To search for peculiarities in burial customs, which might be associated with cranial injuries, we compared the grave contexts of these individuals with 149 burials, without traumas, from the same region (Figure 9.3).

However, the diagnosis of bone defects in archaeological material is flawed by bad preservation—almost every skeleton is more or less incomplete. Further, physical traumas do not necessarily leave traces on the body's hard tissues. Therefore, a positive diagnosis of an intravital or peri-mortem tissue defect is certain in most cases, whereas the absence of trauma indications even in a completely preserved skeleton leaves us uncertain about the trauma history of the individual. A second problem lies in the differential diagnosis of post-mortem damage occurring at a stage when bone still reacts like living tissue (e.g. caused by a collapsing burial chamber) as opposed to intravital injury. We therefore preferred individuals with clear intravital lesions (i.e. marked by healing reactions), and disregarded peri-mortem lesions. Further, the causes of the defects are not as obvious as might seem at first glance (Bruchhaus *et al.* 2006b), but we emphasize defects suspected to have been caused by mechanical trauma.

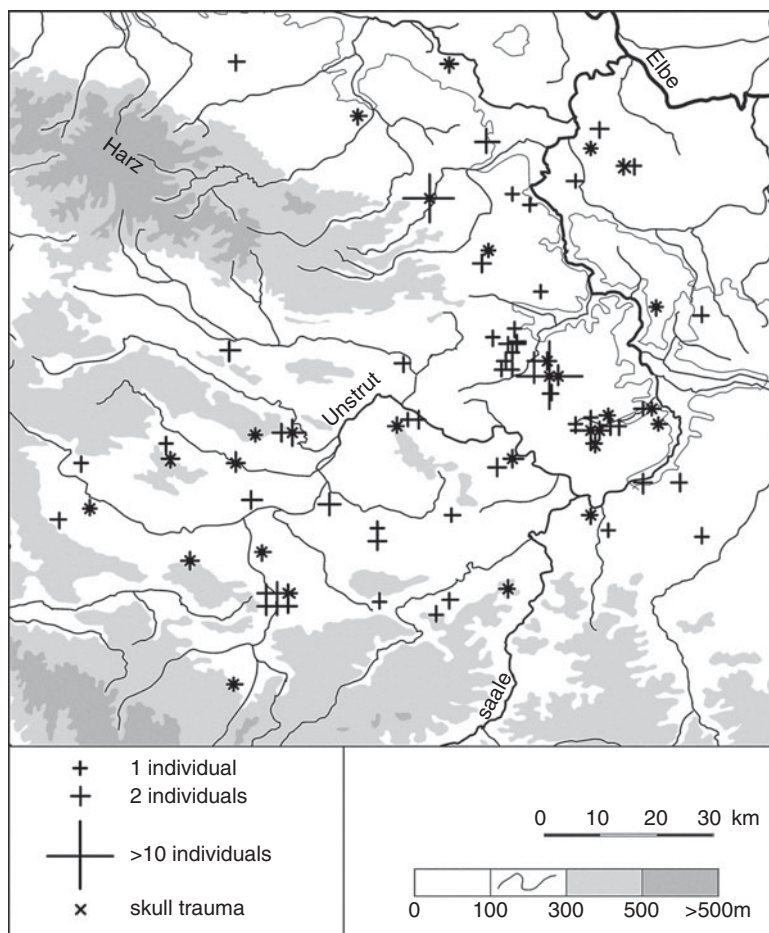


Figure 9.3. Map of western central Germany with all burial sites used in this paper. Burial sites with skull defects are marked.

To enhance readability of the text without overemphasizing the strict differentiation between the population of individuals with a positive defect diagnosis and those with no observable lesions, the former will be referred to as the D-population, the latter as the N-population. Despite the uncertainties of a negative defect diagnosis, a possible regular different burial treatment of the D-population should arise out of comparisons between the two populations.

For the N-population, we selected well-documented CWC burials from the main distribution area, preferably, but not only, from the vicinity of traumatized skeletons (e.g. either the same cemetery or at least the same municipality) (Figure 9.3). Using these criteria, we collected data from 149 individuals regarding grave construction and orientation along with information about grave goods and anthropological data. Given the nature of prehistoric material, not every dataset is complete.

The archaeological information for all burials has been taken from publications, mostly catalogues of the CWC of the Middle Elbe and Saale region (Loewe 1959; Matthias 1964, 1968, 1974, 1982, 1987; Lucas 1965; Feustel *et al.* 1966; Bach *et al.* 1975; Bücke *et al.* 1989), including mainly excavations from the first three-quarters of the twentieth century. The skeletons were examined in the Jena Anthropological Department. The age at death has been expressed in age classes according to Martin (1928): infans I, 0–6 years; infans II, 7–12 years; juvenis, 13–18 years; adultas, 20–40 years; maturitas, 40–60 years; senilis, >60 years. Individuals that could not be linked to one class, but to two adjacent classes counted 50% for each class. Examination of age and sex traits followed the department's standard procedures, after Ferembach *et al.* (1979; cf. Bruchhaus and Neubert 2000).

All parameters have been mapped to rule out local effects. We did not prefer any of the suggested chronological systems, but tested whether the D-population clusters in any one of them, which is not the case—the contexts rather scatter over the suggested ranges. It should also be mentioned that two of the three graves of the D-population with available ¹⁴C-measurements delivered different date ranges. Erfurt (no. 6) dates to 2610–2470 BC and both Bilzingsleben (no. 2) and Braunsdorf (no. 4) to 2460–2280 BC (Müller J. 2001).

RESULTS

Anthropology (Figures 9.4 and 9.5)

At first glance, sex and age determinations reveal a dominance of mature males in the D-population. The relation of 14 males (67%) against seven females (33%) seems to deviate from the balanced sex ratio in

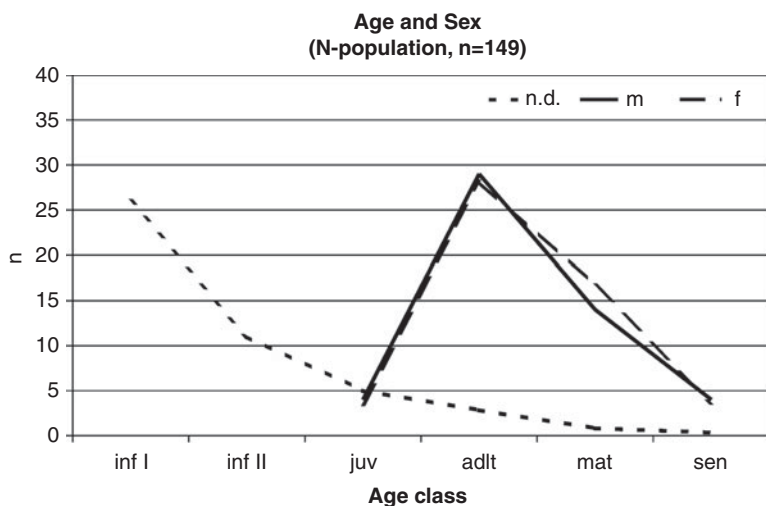


Figure 9.4. N-Population, frequency of age classes in absolute counts (n.d., sex not determinable; m, males; f, females).

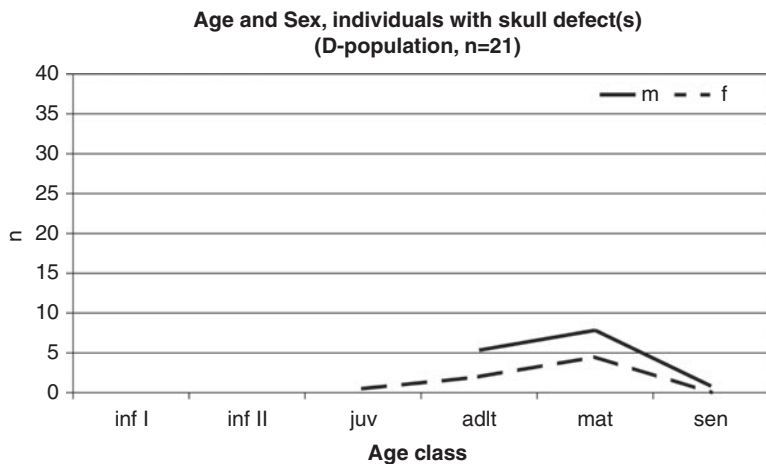


Figure 9.5. D-Population, frequency of age classes in absolute counts (m, males; f, females).

the N-population of 51 males against 52 females. However, this difference is not statistically significant (chi-square test: $P = 0.2$).

Furthermore, both sexes reach their maximum in the D-population in the mature age class, which does not reflect the overall age distribution with a maximum in the adultas stage. A chi-square test of the difference between adultas and the maturitas is significant at the 5% level ($P = 0.02$).

Single and multiple burials

The documentation standard regarding additional individuals in the grave is variable, with some publications mentioning notes such as 'further individual?'. We considered only secured grave contexts.

Almost one-third of the N-population (29%) has been documented in multiple—mainly double—burials. Likewise five of the D-population individuals (24%) were in double burials. All remaining individuals were deposited in single graves.

All five individuals with head lesions from double burials (nos 17–21) were buried together with—as far as they are observable—individuals bearing no signs of lesions. The observations in the 12 double burials of the N-population reveal that combinations with at least one adult ($n = 11$) were far more common than burials with children only ($n = 1$). Combinations of an adult with a child were observed four times and female–male as well as male–male burials three times each. Interestingly, our populations do not contain female-only graves. Double burials with lesion-bearing individuals do not depart from this scheme with two male–male burials and one mixed-sex interment.

One exceptional case is the grave from Bad Dürrenberg (no. 1), which contained, in addition to the primary single burial at the bottom of the pit, disarticulated bones of two further individuals (an adult and child) and CWC sherds in the backfilling of the pit. Perhaps an older double burial had been disturbed during excavation of the single burial pit—although such grave disturbance occurred only rarely in CWC cemeteries.

Deposition side and orientation of the individuals

The positioning of individuals reveals a strict sex-dependent rule. In single burials of the N-population 31 of the anthropologically

determined males with a documented burial position ($n = 33$) were laid on their right side (94%), two on their left. Counts in females of this group are equally striking: only four of 38 individuals rested on their right side, whereas all others (89%) were laid on their left side.

Another aspect of positioning the deceased is body orientation, which is usually along the east–west axis in the CWC. Males were oriented with their heads in the northwest to southwest (about 80% in the N-population), and females in opposition with their heads north-east to southeast (85%).

There is no exception from the ‘side rule’ in the D-population, and all three observable females matched the ‘orientation rule’. One of the eight males (Muschwitz, no. 14), though deposited on his right side, was aligned east–west, which is the preferred female orientation. In addition, another male from Donndorf (no. 5), on his right side, was deposited with his head in the south, which is uncommon (only two males from the N-population = 6% both also from the *adultas* and *maturitas* age classes, were south-oriented).

Position in graveyards

So far, we can only give a few examples rather than a tendency for the D-population. Thus, Braunsdorf grave 34 (no. 3) is situated 10 m apart from the next dense grave group. From the same cemetery, about 90 m to the east, the double burial grave 4 with one individual showing signs of a skull trauma (no. 17) is situated about 20 m apart from the two closest grave groups, but in the immediate neighbourhood of another double burial (grave 5) of which one of the individuals carries symptoms of a deformed foramen magnum (probably pathological). However, both burials lay only 5 m southwest of the borders of the excavated area—it remains unknown, therefore, whether there were more and closer graves in this direction, but the vicinity of two burials with both showing changes in the skull bone, although of different causes, is intriguing.

In Schafstädt, Fundplatz 9, grave 33 (no. 16) is not conspicuously placed; it rather fits into the group of five linear positioned graves.

Grave size and construction

To get a comparable parameter reflecting the amount of labour invested in the grave pit, only volume can be considered, as all

three grave dimensions vary heavily and are only weakly correlated in our populations. Unfortunately, grave dimensions were documented completely only in a few instances. From the 23 single burials of the N-population can be inferred that grave volume in adult burials decreases with increasing individual age, with females exhibiting a mean of 2.3 m³ in adultas ($n = 6$) and 0.8 m³ in maturitas ($n = 3$), and with males showing a mean of 1.3 m³ in adultas ($n = 5$) and 0.8 m³ in adultas/maturitas ($n = 3$). Overall, female graves appear to be larger than male graves, especially in the adultas age class. A possibly related trend could be observed in the Bohemian CWC where surface areas of grave bottoms have been calculated as a measure of labour. There the largest graves contained male adult individuals, but the smallest male graves were exceeded regularly by female graves on every observed cemetery (Wiermann 2001, p.74).

Observations in the D-population are even rarer and can therefore only be used as examples. Data are available from three burials that were all single and female. The grave of a juvenis/adultas from Gieckau/Pohlitz (no. 8) measured 3 m³, Leuna (no. 13) 5.3 m³, and Peißen (no. 15) 1.4 m³, the latter both contained individuals from the adultas/maturitas stage. Leuna and Gieckau/Pohlitz delivered the second and third highest ranks of grave volume in the combined N- and D-populations.

Most graves were simple pits without traces of any fittings. Wooden constructions are very rare and occurred in about 3% of single graves of both sexes in the N-population. Stone structures, in terms of stone coverings or stone cists are more common and, depending on the availability of natural resources, concentrated in the northeastern quarter of the study area (i.e. north of the river Unstrut and east of the Harz Mountains). About 17 (27%) of all the observable single graves ($n = 64$) of the N-population revealed stone constructions that rises to 38% ($n = 15$) in the aforementioned northeastern quarter (with a total of 39 single graves).

In the D-population for the aforementioned very large graves from Leuna (no. 13) and Gieckau/Pohlitz (no. 8), an uncertain wooden construction has been reported for the former and a stone covering for the latter. Beside these two female burials, two male single graves contained stone structures: Helmsdorf (no. 12) with a stone cist and Freienbessingen (no. 7) with uncertain reports about a stone covering.

Grave goods

As it is hard to gain a secure cultural and chronological classification of a burial without grave goods and given that some of the CWC cemeteries were indeed multiperiod, it is a doubtful task to count the number of 'empty' CWC graves (i.e. lacking grave goods). We therefore did not include any empty graves in our study; none the less, there is one female burial in the D-population without any traces of grave goods (Schafstädt, no. 16). Its position among only CWC burials and the typical orientation support its classification as CWC.

The most abundant material used as grave goods is pottery. Amphorae and beakers are the most common types and although we did not investigate further the distribution of types, the variety of vessel types is higher in female burials. A comparison between single graves of the N-population (usable male burials: 36, female: 40) reveals, that simple counts of vessels in female graves surpass those in males (Figure 9.6). The median in female graves is two vessels per burial versus one in male graves. About 22% ($n = 8$) of male and 10% ($n = 4$) of female single burials did not contain any pottery. A similar difference in pottery counts between the sexes is also observable in the Bohemian CWC (Wiermann 1997, p.76).

Distribution in the D-population does not depart from this scheme. Six of 10 male single burials contained two vessels, three

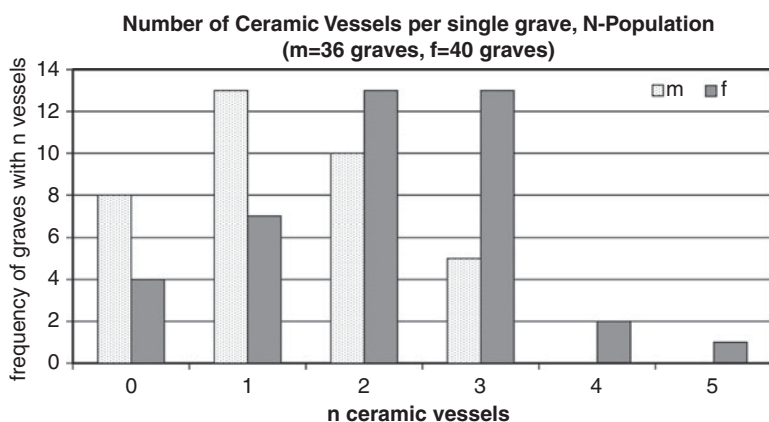


Figure 9.6. Frequency of counts of ceramic vessels in single burials of grown ups, N-population (m, male burials; f, female burials).

contained one, and one grave did not contain any pottery. In the female D-population, numbers are more heterogeneous. Here again the grave from Gieckau-Pohlitz (no. 8) is outstanding with an overall maximum of about six vessels (only partially reconstructable). Two female burials did not contain any ceramic items: Leuna (no. 13) and Schafstädt (no. 16).

While the latter burial has already been mentioned as completely free of grave goods, the grave from Leuna contained more than 75 of the CWC typical canid tooth pendants, which occur in 20% of the female N-population, usually in quantities of more than 20 and up to more than 100 pieces. Unfortunately, the sample of female single burials in the D-population ($n = 6$) is too small to calculate the significance of distribution differences of rare materials, but it shall be mentioned, that neither copper nor shell items, which occur each in about 21% and 24% of the female N-population burials have been documented in D-population graves.

Drilled sheets made of split boar tusks (*Eberhauerlamellen*) have been discovered in rare instances in male graves only. They occur in 8% of the adult male single burial N-population, in a child burial of the same population and in one of the 10 male D-population burials (no. 5).

Worked stone items are concentrated in male graves. The only female burials with stone objects are two graves with stone flat axes, one in each of the N- and D-populations—the latter is again the grave from Gieckau-Pohlitz (no. 8). All remaining stone tools, such as ‘battle’ axes, flat axes, and maceheads, were documented in male burials (Figure 9.7). Twenty-six (72%) of the male N-population burials did not contain any stone items, compared with four (40%) in the male D-population. Something similar can be stated for the rather typical package of one ‘battle’ axe and one flat axe, which occurs in three (8%) male burials of the N-population and three (30%) burials of their counterparts in the D-population. Focussing on ‘battle’ axes emphasizes this pattern, as five of the ten axes in our study belong to D-population single burials (nos 5, 6, 9, 10, and 11). Therefore, 50% of the D-population males included axes, versus only 14% of the N-population (five of 36). Because of the small counts, Fisher’s exact test instead of the chi-squared test has been used to test the hypothesis that battle axes occur more often in D-population burials. The result of the one-sided test is significant ($p = 0.025$).

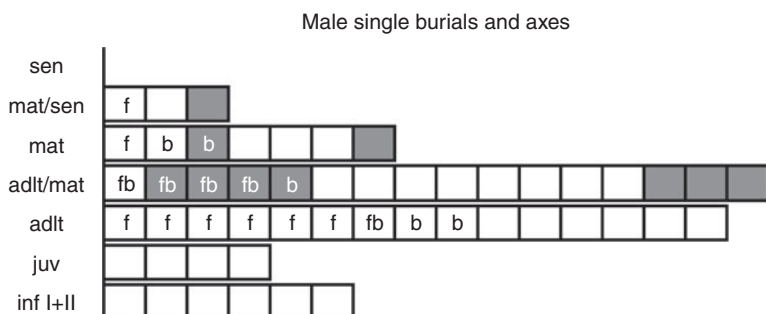


Figure 9.7. Occurrence of axes in male single burials by age classes. Note, that double classes (mat/sen and adlt/mat) include the whole range of both classes and not an age span around the border between the two. One box represents one burial (not shaded, N-population; shaded, D-population; f, flat axe; b, 'battle' axe).

However, significance drops just below the 95% level ($p = 0.062$), if we compare, matching age groups only (adult/mat, mat, and mat/sen).

A double male burial from Braunsdorf (no. 17) with one individual displaying a cranial injury, contained in addition to fragments of five boar tusk sheets, a scarce (in the CWC) piece of worked antler in the shape of an axe head, which is interpreted either as pickaxe head or as an axe mounting (Matthias 1982, 222 ff; cf. Petzold 2005, p.4).

DISCUSSION

The diagnosis of a head lesion in a skeleton, which in a wider view, is a biological characteristic on one hand, and material traces of burial customs, hence archaeological facts on the other, are both parameters from very different disciplines. None the less, investigations that include both perspectives offer new inferences about idiosyncrasies of the CWC.

There are two ways in which physical defects and social, economical, and cultural circumstances can be associated. First, some people might have been more injury-prone due to their position within the economic and social setting (e.g. slaves, who might be more likely to get beaten, warriors with a heightened injury risk in fights, or some kinds of craftsmen, working under dangerous circumstances, with heavy loads, in high altitudes, etc.). In these cases, possible peculiarities

in material culture and their association with physical trauma are not directly dependent on each other but are both related to the social and economic position of the individual. So special duties within the cultural setting might have heightened the injury risk and therefore, given that the position of the individual is reflected in the burial rite, lesions and burial circumstances may be connected indirectly.

Alternatively, reactions of the social and cultural environment might be more directly influenced by a physically traumatic event or circumstances that lead to the trauma. The event itself, a visible scar or altered behaviour after a head injury (Piek 2008) might have led to a change in how the affected individual was perceived in their society, and subsequently in interactions with her or him. An impressive example of this kind of interrelation is the Mesolithic burial from Bad Dürrenberg (Saalekreis), where authors suggest connection between the outstanding burial rite and distinct pathological features (Porr and Alt 2006). Likewise, if the injury had been fatal, the violent death could have provoked a special burial rite. The above two circumstances do not exclude one another, but both offer possibilities for inferences about the presence or absence of archaeological peculiarities in graves of the D-population.

The highest frequency of skull traumas in mature individuals suggests that there were no special age-dependent events, such as a *rite de passage*, within the lifetime of a CWC individual with a heightened risk of receiving a head injury. Otherwise, traumas would be expected to show a sharp increase in one age class and be more evenly scattered in older ages. The slow rise of the frequency over ages rather suggests a dependency between spent lifetime and probability of being injured—the more time one spends in a somehow unpredictable and to some degree risky environment the more likely it becomes to receive an injury.

The lack of any regularity between a head injury and observable burial parameters in female graves reveals the minor—or absent—role the injury and its context had played in the burial rite visible to us. However, slight deviances in single cases may reveal a differential view on the person affected, even though all of those deviances fall within the range of the N-population, hence the ‘normality’. Regardless of accepting a social stratification (e.g. O’Brian 1978; Hummel 2000; Bruchhaus *et al.* 2002) or not, we can state that the two graves from Leuna (no. 13) and Gieckau-Pohlitz (no. 8) seem to be in some variables, if not exceptional, then at least close to the upper extremes. For Gieckau, with its abundant pottery and a stone axe within a very

large pit plus stone covering, an unrecognized double burial might be plausible (excavated in 1935); however, the Leuna grave alone, with over 75 canine tooth pendants in a very voluminous grave, would support the existence of the combined appearance of skull lesions and what are usually considered as wealthy or 'upper' social strata parameters. The female burial from Schafstädt (no. 16) with no grave goods at all is positioned at the other end of the scale, while that from Peißen (no. 15) with an average grave pit and one vessel, together with the remaining female burials, lay somewhere in between. Although the low counts of the grave contexts considered here are far from fully representative, we can suggest that lesions in female individuals occur over the whole possible spectrum between 'rich' and 'poor' burials. The location of skull defects in females scatters, as in males, on the front and top, but reveals no tendency to a side—the seven documented injuries spread equally (two left and right side each, three sagittal). So far, from an archaeological perspective nothing else than randomness, maybe in terms of accidents or domestic violence, etc. can be purported for skull lesions in female individuals.

The tendency in D-population male graves to be slightly richer in ceramics, together with the conspicuously raised numbers of stone tools, especially 'battle' axes, provides a better base for interpretation. Societies at the threshold between transegalitarian organization and the rise of first élites—as has been suggested for the CWC (Strahm 2002)—are prone to instabilities (Bogucki 1999, 267 ff), where power can easily be challenged and lost. The lack of mass burials does not necessarily suggest the absence of routinely brutal group conflicts within the CWC—the exceptional site of Eulau (Haak *et al.* 2008) might even point in that direction. But the higher frequency of injuries in men as well as the concentration of defects in males on the left front and top side of the skull (eight of 13), which has been also observed in other studies (Lidke 2005, pp.151, 153, table 27), renders face-to-face fights among mostly right-handed men plausible. Further studies are necessary to connect the stated organizational stage of the CWC society and its implied instability with fights among axe-brandishing power-mongers or whether we are looking at the outcomes of 'normal' male aggression (i.e. as testosterone levels are positively correlated with aggressive behaviour and testosterone levels in males are much higher than in females) (Gladue 1991, 320 ff; Harris *et al.* 1996).

Whatever the larger social implications may be, currently we can conclude that the association between the aforementioned skull defects and stone items implies that the latter might have been used not only as status symbols (Malmer 1992, p.243) or tools, but also as weapons. Indeed, most of the neurocranial lesions in our D-population could have been inflicted by such a weapon or something similar, either with a sharp edge or a flat end, both of which are present in the 'battle' axes. In fact, this co-occurrence implies that those men were involved in armed fights and that a connection existed between the axe in the grave and a somehow aggressive, maybe warrior-like attitude during their lifetimes.

In her very elaborate paper about warriorhood in the, among others, Bohemian CWC, Helle Vandkilde wrote that 'battle' axes were as much weapons as they were symbols of an élite as well as for masculinity. She suggests a rank-based warriorhood institution, which means, that a group with restricted access 'dominate[d] precisely through military resources of power (warrior elite)' (Vandkilde 2006, p.400). In the case of the Bohemian CWC this élite is marked by weapons (males) and ornaments (females) in burials and consisted of about 50% of each age class except for small children (infans I) and people older than about 50 years (cf. Wiermann 2002). As in central Germany, a strict gender differentiation in burial customs and grave goods is obvious. We further find parallels in the age distribution of 'wealthy' graves (>2 ceramic vessels, canid teeth, shell ornaments, etc.), which already appears in the infans I class. Almost all types of ornaments known from adult female burials were found in one or the other child grave (e.g. shell disks occur in three of the 28 child single burials of our sample). What is striking in those contexts is the absence of copper ornaments as a privilege of the female adult sphere on one hand and axes on the other. The earliest possible appearance of these strictly gender-related goods is in juvenile graves—this differs slightly from Bohemian customs, where weapons and copper appear in infans II burials (ibid., Abb. 1). Thus the heritability of a weapon and with it the probable membership in a 'warrior élite' is not so obvious in the central German CWC. None the less, the occurrence of up to four vessels, shell items and—in one instance—of a split boar tusk in infant graves of our sample makes the heritability of status (symbols) plausible. It seems that axes and everything that might be connected with them were something that had to be earned by individual deeds—the connection between axe/warriorhood and

‘élite by birth’ is not as obvious as in Bohemia. Furthermore, the connection between (probably fight-inflicted) skull injuries and axes indeed offers the conclusion that those men took risky and probably prestigious challenges.

Hence, we can propose that, although the overall picture does not reveal special treatment of injured individuals, at least some of those who lived by the axe, carried a greater risk to be wounded or to perish by the axe.

ACKNOWLEDGEMENTS

We would like to thank Andreas Sattler MA (Halle) for his interest in our work and the fruitful discussions and debates he had with us.

APPENDIX

List of individuals with skull defects (D-population)

Entries are numbered according to references in the text. For re-identification reasons the place of discovery, museum, and museum catalogue number of the skeletons are provided, followed by a short anthropological summary and references to publications. The order is alphabetical, using the original findspot names. However, some of the sites have been incorporated into larger municipalities afterwards. The municipality is mentioned, followed by the division name (recognizable by ‘OT’). Current districts (May 2009) are provided within brackets.

Abbreviations

OT, Ortsteil (division, sector); Ldkr., Landkreis (district); M, museum; A, anthropological data (age at death, sex diagnosis); m, male; f, female; ju, juvenis; ad, adultas; ma, maturitas; se, senilis; D, defect description; r, right side; l, left side; P, bibliographic references.

Single burials

1. Bad Dürrenberg (Saalekreis), OT Keuschberg, Bunsenstraße 10, grave 1/1963
 M: Halle (63:169a)
 A: ad/ma, m
 D: hole defect, os frontale (l), intra-vitam, survived for a longer period
 P: Matthias (1982, p.94)
2. Bilzingsleben (Ldkr. Sömmerda), gravel pit, grave 42/1971
 M: Bad Frankenhausen (III:1374)
 A: ad/ma, f
 D: furrow-shaped impression along the sutura metopica, os frontale (l), intra-vitam, survived, at least for a short period
 P: Matthias (1974, p.60); Müller J. (2001, p.80)
3. Braunsbedra (Saalekreis), OT Braunsdorf, Galgenberg, grave 34/1927
 M: Halle (27:305a)
 A: ma/se, f
 D: superficial bone reaction, ossa frontale et parietale, intra-vitam, survived for at least a short period
 P: Matthias (1982, p.26)
4. Braunsbedra (Saalekreis), OT Braunsdorf, gravel pit Müller, grave 12/1912/13
 M: Merseburg (S 130)
 A: ad/ma, m
 D: cut marks, os parietale (l), probably intra-vitam
 P: Matthias (1982, p.31); Müller J. (2001, p.81)
5. Donndorf (Kyffhäuserkreis), 1 km Northwest of the village, grave 1/1971
 M: Bad Frankenhausen (III:1383a)
 A: ma, m
 D: funnel-shaped hole defect above the Orbita, os frontale, intra-vitam, survived (l)
 P: Matthias (1987, p.71)
6. Erfurt, north of the Medizinische Akademie (MAE), grave 11b
 M: Weimar (W 2637; MW 974/81)
 A: ad/ma, m

- D: furrow-like depressions along the sutura sagittalis, os frontale (r), traces of superficial bone reactions, intra-vitam, survived for at least a short period
P: Bücke *et al.* (1989, p.46); Müller J. (2001, p.82)
7. Freienbessingen (Kyffhäuserkreis), 'Großes Horn', grave 3/Hg. 2/66
M: Weimar (W 1292)
A: ad/ma, m
D: oblong impression fracture, os frontale (l), intra-vitam, survived for a longer period
P: Bücke *et al.* (1989, 50f)
8. Gieckau (Burgenlandkreis), OT Pohlitz, municipal gravel pit, grave 1/1935
M: Halle (35:70a)
A: ju/ad, f
D: two hole defects, os frontale, no healing reactions
P: Matthias (1974, p.206)
9. Großengottern (Unstrut-Hainich-Kreis), east of the brickyard, grave 1/1965
M: Mühlhausen (III/65/5a)
A: ad/ma, m
D: shallow impression next to the sutura coronalis, os parietale (l), cause and point in time unknown
P: Feustel *et al.* (1966, 63f and p.128)
10. Großfahner (Ldkr. Gotha), 'Sommerberg', grave 1/1965
M: Weimar (MW 481/74)
A: ad/ma, m
D: hole defect, os parietale (l), intra-vitam, survived for a longer period
P: Bücke *et al.* (1989, 53f)
11. Krautheim, OT Haindorf (Ldkr. Weimarer Land), Allstedter Mühlberg, grave 28
M: Weimar
A: ad/ma, m
D: hole defect, os frontale et ossa parietalia (r, l), intra-vitam, survived for at least a short period
P: Bavin-Steding (1997, 14 ff); Northe *et al.* (2001, p.58)

12. Heilighenthal (Ldkr. Mansfelder Land), OT Helmsdorf, Sehringsberg, grave 1/1908
M: Halle (14139a)
A: ma, m
D: hole defect, central part ossa parietalia (sutura sagittalis S2 till S3), survived for a longer period
P: Matthias (1974, p.134)
13. Leuna (Saalekreis), grave 1/1916
M: Halle (16:1105a)
A: ad/ma, f
D: shallow furrow-shaped impression, crossing the bregma, ossa frontale et parietale (r), intra-vitam, survived for at least a short period
P: Matthias (1982, p.106)
14. Muschwitz (Burgenlandkreis), 500m west of the village, grave 1/1943
M: Halle (43:4a)
A: ma/se, m
D: furrow-shaped depression, os frontale, intra-vitam, similar to Leuna (see above), but smaller, cause unknown; atrophy of the processus alveolaris maxillae (l) of unknown cause
P: Matthias (1987, 96 ff)
15. Peißen (Saalekreis), sandpit next to the Hartsteinwerk, grave 1/1958
M: Halle (59:9a)
A: ad/ma, f?
D: hole defect, os parietale (l), no healing reactions
P: Matthias (1982, p.132); Müller H.-H (1960); Matthias and Ullrich (1968, 37f)
16. Bad Lauchstädt (Saalekreis), OT Schafstädt, Fundplatz 9, grave 33/1955
M: Halle (55:94)
A: ma, f
D: fracture of the Radix nasii, uncertain healing reactions
P: Matthias (1982, p.160)

Double burials

17. Braunsbedra (Saalekreis), OT Braunsdorf, Galgenberg, grave 3 and 4 (one double burial)
M: (a) grave 3: Halle (27:277a); (b) grave 4: Halle (27:278a)
A: (a) grown up, m; (b) grown up, m?
D: (a) no defects observable; (b) hole defect in the area of the suturae coronalis et sagittalis, os parietale (r), intra-vitam, survived for a longer period
P: Matthias (1982, 22 ff)
18. Laucha (Burgenlandkreis), OT Dorndorf, Aviation area, grave 2/1934
M: (a) 'Bestattung A': Halle (34:267a); (b) 'Bestattung B': Halle (34:276i)
A: (a) ma, f; (b) ma, m
D: (a) no defects observable; (b) 1. hole defect, os parietale (r), intra-vitam, survived for a longer period; 2. furrow- and pit-shaped depressions, os parietale (l), intra-vitam, survived for at least a short period; 3. bone reactions, os frontale till os parietale (l), intra-vitam, survived for at least a short period
P: Matthias (1974, 94 ff)
19. Bad Lauchstädt (Saalekreis), OT Schafstädt, Fundplatz 16, grave 1/2/1962
M: (a) Halle (61:75a); (b) Halle (61:75b)
A: (a) ad/ma, m; (b) ad, sex not determinable
D: (a) hole defect, ossa frontale et parietale (l), intra-vitam, survived for a longer period; (b) no defects observable
P: Matthias (1982, p.179)
20. Bad Lauchstädt (Saalekreis), OT Schafstädt, Fundplatz 28, grave 2/Stelle 1
M: Halle (69:173a)
A: ma, f; probably fragments of an additional, not examined individual
D: considerable impression, os parietale (r), intra-vitam, survived for at least a short period
P: Matthias (1982, 181 ff)

21. Unseburg

M: (a) Halle (87:669a); (b) Halle (87:669b)

A: (a) ad, m; (b) ad/ma, m

D: (a) no defect observable; (b) hole defect, imprimat preserved, os parietale (l), intra-vitam, survived for a longer period

P: Bruchhaus/Holtfreter (1989)

Investigating cranial trauma in the German Wartberg Culture

Linda Fibiger

Cranial remains of 186 individuals belonging to the Late Neolithic Wartberg Culture of central Germany were examined for evidence of trauma that could indicate interpersonal violence. The remains came from three collective burials in North Rhine-Westphalia and Hessen, excavated between 1934 and 1993. A total of 13 individuals (7%) presented with evidence for healed trauma whereas unhealed cranial injuries were noted on eight individuals (4.3%). Interpersonal violence appears to have been endemic and to have affected all sections of society.

THE WARTBERG CULTURE: A BRIEF OVERVIEW

The Later Neolithic Wartberg group can be found in Hessen, North Rhine-Westphalia, and Thuringia between 3500 and 2800 BC and shows influences of the preceding Michelsberg and Baalberger as well as the contemporary late Funnel Beaker horizons (Raetzel-Fabian 2002a,b; Table 10.1). One of its defining features is the construction of geographically well-delimited collective burials, mostly gallery graves, from approximately 3400 BC onwards (Raetzel-Fabian 2000a,b, 2002b). The graves are often grouped in small clusters and it has been suggested that they relate to lineages or represent tribal markers (Hinz 2007). Some examples, such as Warburg I and Züschen, display megalithic art that depicts wheel,

cattle, and anthropomorphic as well as abstract designs (Günther 1990, 1997; Raetzel-Fabian 2000b). These collective burials contained the remains of up to 100 + individuals that appear to have been placed in monuments as intact bodies, though continuous use of the graves over time led to increasing disarticulation (Jordan 1954; Hinz 2007). The extent of grave goods varies and may include pottery, lithics such as arrowheads and blades, amber beads, perforated animal teeth, shells, and occasionally copper objects. Axes generally appear to play a small role but include square-sectioned examples (Jacobs 1999; Raetzel-Fabian 2000b). Many settlements are located on hilltops or mountains, including some of the Wartberg enclosures, which often feature defensive elements such as palisades and ditches (Probst 1999, p.373; Raetzel-Fabian 2002b).

THE SITES

The skeletal remains examined for this study came from a number of different sites, including the gallery graves at Altendorf in Hessen, the complex at Warburg (I, III, and IV), and the Erwitte-Völlinghausen site in North Rhine-Westphalia (Figure 10.1). Altendorf was initially discovered during agricultural work in 1907, but it was not until 1934 that its extent was fully recognized and the gallery grave excavated during a 3-month season under the direction of W. Jordan (Jordan 1954, p.5). The collective burials at Warburg came to the attention of archaeologists after the landowner Josef Michels reported the discovery of human remains in 1955, though archaeological investigations did not start until 1986 when permission for trial excavations was given by his son Robert Michels. This ultimately led to the full excavation of five collective burials, including four stone-built and one wood-built structure, under the direction of K. Günther between 1987 and 1993. Skeletal remains from three of these were analysed for this study. The grave at Völlinghausen was excavated by H. Menne of the Westfalian Museum for Archaeology (under the direction of R. Hömberg) during three summer seasons between 1991 and 1993 (Menne 1991–93). It represents a subgroup of the megalithic collective burials of the period, a ‘Mauerkammergrab’. These structures are collective burial monuments that include a burial chamber made of dry stone.

Table 10.1. German Neolithic chronology (after Lüning 1996; Abb. 1; Preuß 1999)

Years BC	Period	Southern Germany	Central Germany	Northern Germany
2200 BC	Early Bronze Age	Early Bronze Age	Early Bronze Age	‘Dolchzeit’ [Dagger Culture] Bell Beaker [Nordic Late Neolithic]
2800 BC	Endneolithikum [Final Neolithic]	Bell Beaker Corded Ware	Bell Beaker Schönfeld Corded Ware	Single Grave Culture [Nordic Middle Neolithic]
3500 BC	Spätneolithikum [Later Phase of Late Neolithic]	Wartberg	Bernburg Walternienburg	Elb-Havel Culture Later Funnel Beaker [Nordic Middle Neolithic]
4400 BC	Jungneolithikum [Earlier Phase of Late Neolithic]	Michelsberg	Baalberg Jordansmühl Gatersleben	Earlier Funnel Beaker [Nordic Early Neolithic]
5000 BC	Mittelneolithikum [Middle Neolithic]	Rössen Stichbandkeramik Großgartach Hinkelstein	Stichbandkeramik Rössen	
5500 BC	Alt/Frühneolithikum [Early Neolithic]	Linearbandkeramik La Hoguette	Linearbandkeramik	Ertebølle

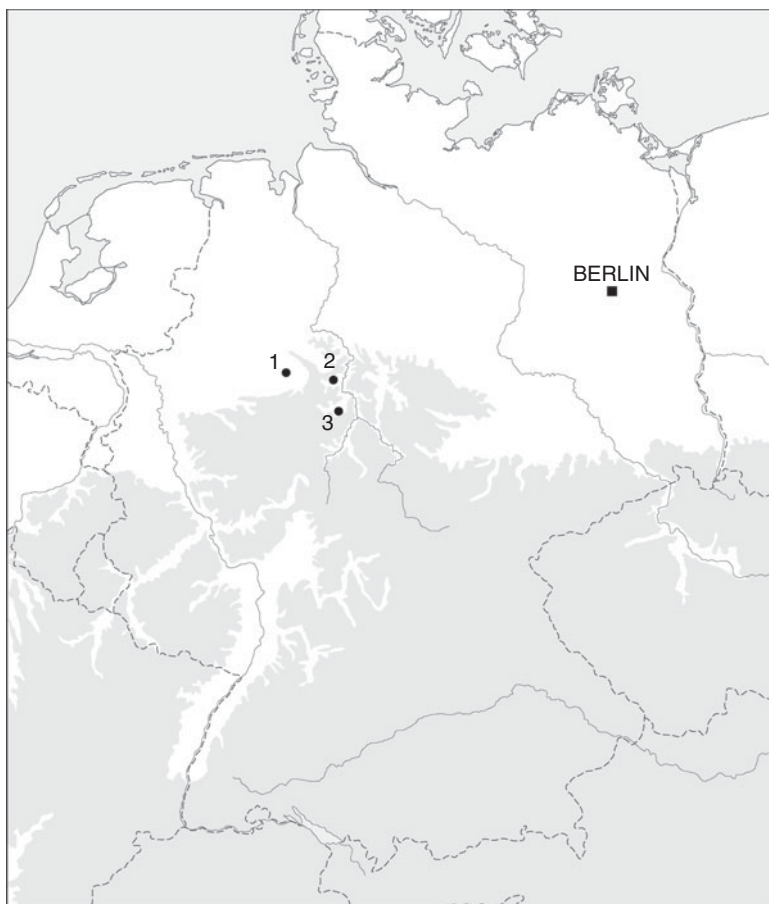


Figure 10.1. Location of Wartberg sites discussed in the text. 1. Erwitte-Völlinghausen. 2. Warburg I, III and IV. 3. Altendorf.

The only osteological analysis carried out on the remains from Altendorf was part of a late 1930s morphological study of the racial origins of the Hessian population (Perret 1938); unfortunately, only a proportion of the assemblage, which originally consisted of more than 100 individuals, survives today. The skeletal remains from Warburg were analysed by H. Löwen but only basic anthropological data (age, sex) and a selection of pathological cases (including degenerative joint disease, trauma, and dental disease) were published

(Löwen 1996, 1997; Löwen in Günther 1997). The skeletal remains from Völlinghausen were analysed by H. Löwen but no osteological report for the site was completed.

THE SKELETAL REMAINS

A total of 186 partial or complete crania dating to the Wartberg culture were examined, including 77 individuals from Altendorf, 61 from Warburg I, II, and IV and 48 from Erwitte-Völlinghausen. The remains are part of a larger cranial trauma study of over 1000 individuals from northern Europe (Fibiger 2009). Most of the crania in this study could not be securely associated with any postcranial remains and age and sex assessment therefore had to rely on cranial features only. These included morphology of the cranium and mandible (when available) for sexing of adult remains (>17 years), observing closure of the metopic suture, fusion of the occipital bone and dental calcification, growth, and eruption for juvenile (1–12 years) age assessment (Ubelaker 1989, fig. 71; Smith 1991; Scheuer and Black 2000) and eruption of third mandibular molar and molar dental wear, supplemented by recording fusion of the sphenoid–occipital synchondrosis, for ageing older adolescents (13–17 years) and adults (Brothwell 1981; Smith 1991; Scheuer and Black 2000).

The assemblage included 54 adult males, 54 adult females, 32 unsexed adults, 20 adolescents, and 26 juveniles aged between 3 and 12 years (Table 10.2). Within the adult age group, 31 individuals were young adults probably aged between 18 and 25 years, whereas 52 could be classed as middle adult (26–45 years), with a further 57 only classified as ‘adult’ (Table 10.3).

Table 10.2. Age distribution according to site

Site	Adult male	Adult female	Unsexed adult	Adolescent	Juvenile
Altendorf	32	27	7	6	5
Warburg I, III, and IV	10	19	16	7	9
Erwitte-Völlinghausen	12	8	9	7	12
Total	54	54	32	20	26

Table 10.3. Age distribution of total adult sample

Sex	Young adult	Middle adult	Adult
Male	9	26	19
Female	19	21	14
Unsexed	3	5	24

CRANIAL TRAUMA

Injuries or fractures can occur during life (ante-mortem), around the time of death (peri-mortem), or result from depositional processes or excavation and post-excavation handling taking place after death (post-mortem) (Lyman 1994; Boylston 2000). To distinguish ante-mortem from peri- or post-mortem defects it is necessary to observe closely the appearance of wounds or fracture margins as living bone exhibits different biomechanical properties and fracture patterns to that of dry bone (Quatrehomme and Işcan 1997; Sauer 1998; Verhoff and Kreutz 2003; Dirkmaat *et al.* 2008). A number of criteria have been established to differentiate the timing of injuries and were applied during this study, including: signs of healing such as remodelling and rounding of wound margins for ante-mortem injuries; depressed but adhering bone, secondary linear and concentric radiating fractures, oblique angles on fracture margins, and characteristic bevelling or flaking on the inner aspects of the primary defect for peri-mortem fractures (Polson *et al.* 1985; Galloway 1999; König and Wahl 2006); and more irregular fracture patterns with right-angled fracture margins for post-mortem defects. In the latter, adhering bone and internal bevelling are rare and colour differences (i.e. patination) between fracture surface and surrounding bone tend to be quite pronounced (Roberts and Manchester 2005, p.116; Byers 2008, p.289).

Clinical and forensic data from documented cases of violent and accidental cranial trauma allows the recognition of distinct blunt force, sharp force, and projectile trauma patterns typical for, or associated with, intentional violence and assault (Danielsen *et al.* 1989; Kjaerulff *et al.* 1989; Shepherd *et al.* 1990; Brown and Civil 1993; Boström 1997; Brink *et al.* 1998; Byers 2008). These can be compared with archaeological cases to help determine the aetiology

of a given archaeological traumatic lesion. During the Neolithic, three main groups of implements or weapons that could have been used during violent encounters are projectiles (including arrows as well as other missiles such as stones), clubs and sticks (including simple wooden batons as well as stone-topped maces), and stone axes and adzes. While arrowheads can produce perforating defects, blunt force projectiles such as stones as well as clubs, sticks, and maces will result in blunt force injuries, which in cranial trauma can range from shallow depressions to more extensive depressed fractures. Depending on the manner in which they are employed, axes and adzes produce head injuries that can show characteristics of both blunt force (due to their bulk and weight) and sharp force trauma (as a result of the bladed edge of the implement) (Wahl and König 1987).

During the current study, 20 individuals presented with skeletal changes indicative of traumatic injuries to the head (Table 10.4), including eight from Altendorf (10.3%), nine from Warburg (14.7%), and three from Erwitte-Völlinghausen (6.2%). One of the individuals from Warburg, an unsexed adult (4099), had been affected by healed as well as unhealed trauma and was counted for both healed and unhealed trauma percentage frequencies.

At Altendorf, only one individual (1.3%) was affected by unhealed trauma, whereas in seven cases (9%) healed traumatic lesions were recorded. At the Warburg site, three individuals (4.9%) presented with healed cranial trauma and seven (11.4%) were unhealed. At Erwitte-Völlinghausen, only healed injuries were recorded, affecting three (6.2%) individuals.

There was no significant difference between the three assemblages when comparing overall trauma rates ($\chi^2 = 2.042$; $df = 2$; $P = 0.360$) though a significant difference was noted in unhealed trauma rates between the two assemblages that presented with unhealed cranial injuries ($\chi^2 = 6.455$; $df = 1$; $P = 0.011$). At Altendorf, only 1.2% of individuals presented with unhealed trauma, whereas this figure was much higher at Warburg with 11.4%. Interestingly, in both assemblages the sample of those presenting with peri-mortem head trauma included juvenile individuals.

Unfortunately, many of the injured adult individuals from Warburg could not be sexed; therefore, a detailed comparison of differences in injury rates between the sexes was excluded. When considering all of those adult Wartberg individuals that could be

Table 10.4. Cranial trauma at Altendorf, Warburg, and Erwitte-Völlinghausen

Site	No.	Sex and age	Trauma description
Altendorf	A11	Mid-adult female	Healed depression: posterior parietal (L)
Altendorf	A71	Older mid-adult male	Healed depression: posterior parietal (L&R)
Altendorf	A73	Older mid-adult female	Healed depression: posterior parietal (R)
Altendorf	A137	Juvenile	Peri-mortem fracture: lateral parietal (R)
Altendorf	A140	Mid-adult male	Multiple healed depression: posterior parietals (L&R)
Altendorf	A167	Mid-adult male	Multiple healed depression: frontal, parietals (L&R)
Altendorf	A175	Mid-adult male	Scalp injury with osseous involvement: central frontal
Altendorf	A213	Young mid-adult male	Healed depression: posterior parietal (R)
Warburg I	4099	Adult	Healed depressed fractures: posterior parietals (L&R); peri-mortem fracture: lateral parietal (R)
Warburg III	6596	Mid-adult	Healed depression: parietal (R)
Warburg IV	319	Adult	Trepanation (probably following trauma): posterior parietals (L&R)
Warburg I	2457	Adolescent	Peri-mortem fracture: lateral frontal (L)
Warburg III	6584	Adult	Peri-mortem fracture: posterior-lateral parietal (L)
Warburg III	6591	Adult female	Peri-mortem fracture: anterior frontal (R)
Warburg III	Q23C	Adult	Peri-mortem fracture: lateral parietal (L)
Warburg III	Sk62	Juvenile (7–10 years)	Peri-mortem fracture: superior parietal (R)
Warburg IV	360	Young adult female	Peri-mortem fracture: superior parietal (R)
Erwitte-Völlinghausen	V150	Young mid-adult female	Healed depression: anterior frontal (R)
Erwitte-Völlinghausen	V423	Young adult female	Healed depression: superior parietal (L&R)
Erwitte-Völlinghausen	V425	Adult	Multiple healed depressions: parietal (R)

L, left; R, right.

sexed, injury rates were similar but slightly higher in females, with 9.2% of males and 11.1% of females affected. Even in the Altendorf assemblage where more of the adult individuals could be sexed, the difference in injury rate between males (15.6%) and females (7.4%) was not statistically significant ($\chi^2 = 0.946$; $df = 1$; $P = 0.331$).

In 16 of the 20 individuals that presented with trauma injuries were on the parietals, most frequently the posterior aspect, with the lateral and superior aspect less frequently affected. Also present were a smaller number of frontal injuries, both healed and unhealed. The majority of healed lesions consisted of small, relatively shallow depressions of the vault surface (Figure 10.2), though a number of more extensive injuries that involved the endocranial aspect were also noted (Figure 10.3). Unhealed injuries consisted of either extensive curve-linear fractures (Figure 10.4) or smaller oval or circular defects (Figure 10.5).

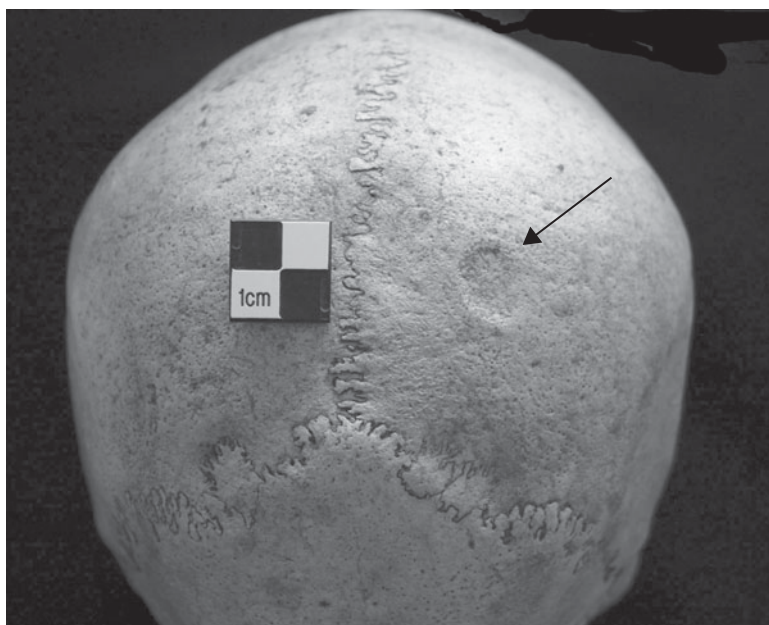


Figure 10.2. A73, Altendorf. Healed depression of left posterior parietal (Photo: L. Fibiger).



Figure 10.3. 4099, Warburg I. Two healed depressed fractures of the left/right posterior parietals (Photo: L. Fibiger).



Figure 10.4. 2547, Warburg I. Peri-mortem fracture of left lateral frontal (Photo: L. Fibiger).

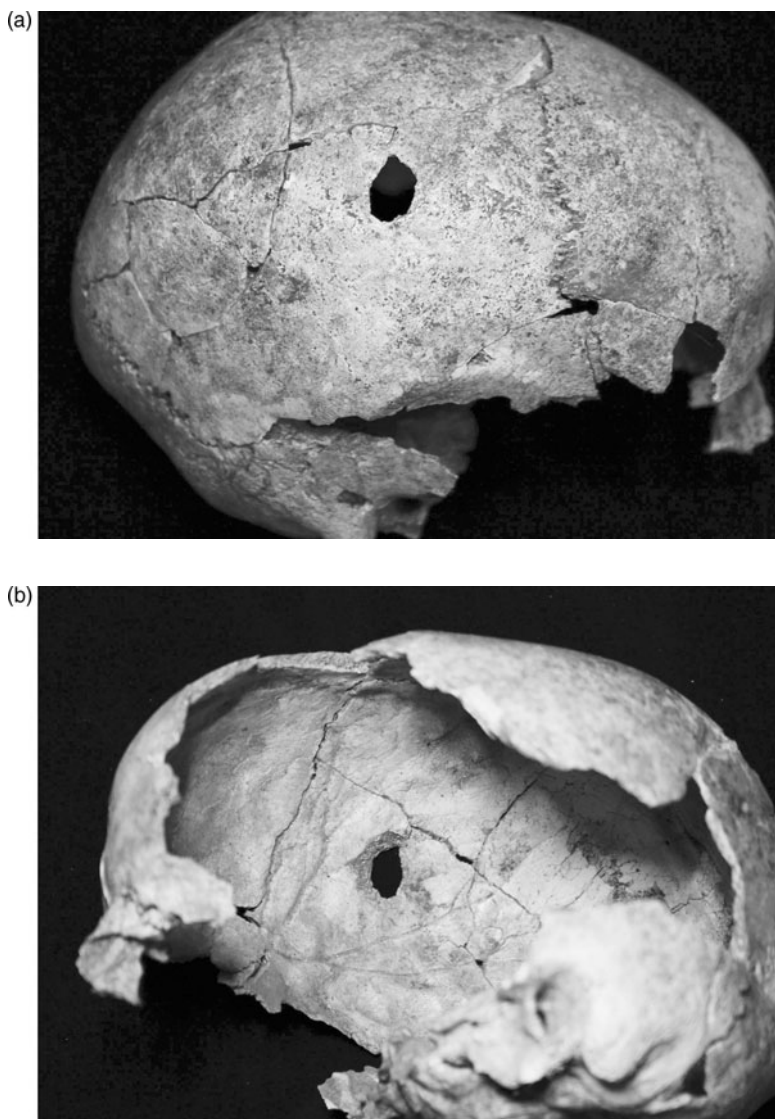


Figure 10.5. A137, Altendorf. Peri-mortem fracture of right lateral parietal. (a) Ectocranial view. (b) Endocranial view (Photos: L. Fibiger).

DISCUSSION

Distinguishing interpersonal violence from accidents, falls, ritual practices, or disease processes is not necessarily as 'straightforward' as sometimes suggested (Martin 1997, p.51; Jurmain 1999, p.187) and the skeletal lesions resulting from it may be very similar to that produced through accidents (Ferguson 1997, p.323). At the same time, a comparison of archaeological trauma data with clinical and forensic data enables the diagnosis of trauma resulting from interpersonal violence (for examples see Danielsen *et al.* 1989; Kjaerulff *et al.* 1989; Shepherd *et al.* 1990; Brink *et al.* 1998; Byers 2008; Kremer and Savaudeau 2009). The head has remained a prime target for close-quarters assault through the ages, probably for strategic as well as psychological reasons. Although postcranial violence-related injuries may characteristically affect the ribs, scapula blade, and forearm (Brickley and Smith 2006; Judd 2008), cranial trauma is more likely to be the result of violence than postcranial fractures. Even when considering that not every violence-related injury will affect the head and that not every head injury will result in osseous changes, cranial trauma patterns remain a very good general indicator of the level of interpersonal violence within a population (Jennett 1996; Murray and Lopez 1996).

The cranial trauma data presented in this study indicate a relatively high risk of being affected by interpersonal violence within the Wartberg culture, with 10.8% of all individuals examined showing evidence for cranial trauma. As not all individuals in this study presented with complete crania, this relatively high figure still only presents a minimum number of injuries/individuals affected. Within the sexed sample, prevalence rates for males and females are very similar. Even though this result has to be interpreted with caution in view of the number of unsexed adult individuals in the Warburg and Erwitte-Völlinghausen assemblages in particular, it still seems to indicate that men and women had a similar risk of sustaining violence-related injuries. Less clear is whether these injuries indicate active involvement in violent conflict. In face-to-face combat, provided both opponents are right-handed, injuries tend to affect the left side of the head. In the Wartberg females, the right side was involved in five of six and the left in only two of six cases, whereas the two sides were equally affected in injured males. This may potentially be indicating that women, rather than being aggressors and actively involved in violent conflict, were

more likely to be in a disadvantaged position during violent encounters (e.g. on the ground, turning away from their potential opponent, unarmed, unable to defend themselves, subjected to surprise attacks, etc.). A similar pattern was observed in a much larger sample of Middle to Late Neolithic individuals from Denmark and Sweden as well as earlier Neolithic skeletal material from other German sites (Fibiger 2009; cf. Schulting and Wysocki 2005 for a similar pattern in the British Neolithic); however, the sample of injured individuals here is small and more trauma data from the Wartberg cultural horizon is needed to substantiate this interpretation.

The peri-mortem injuries noted on two children under 12 years are probably less likely to result from active engagement in violent interaction than any injuries found on adult remains, even when considering that concepts or notions in childhood would probably have been rather different; many children were probably expected to assume responsibilities within their tribe or group at an early age, including both group defence and self-defence at times of conflict. At the same time, the latter would have very much depended on physiological fitness and size, and children may still have been injured during a raid or ambush, or even have been part of ritual events that entailed violence (Lidke 2002).

More healed than unhealed injuries were noted, and many of the healed injuries were relatively minor, non-penetrating lesions, raising interesting questions both about the mechanism that produced the lesions as well as the intentions behind them (i.e. whether they were meant to simply stun and injure or actually kill). When assessing the aetiology of many of the smaller depressions (Figure 10.2) it is important to consider instruments such as wooden clubs or sticks as well as antler picks as readily available tools and weapons (Webber and Ganiaris 2004, p.126; Gauvry 2008). Depending on their shape and how they were employed, these objects could have resulted in some of the smaller depressions observed. With regard to the peri-mortem injuries observed in the sample, simple stones or rocks as well as wood and stone clubs present potential weapons, as do axes that may have also been employed as clubs rather than as chopping tools.

As for the question of intent, the relatively manageable effects of the smaller healed injuries that appear to be predominant may be indicating that to kill was not necessarily the prime objective, but rather to stun, distract, disable, or physically overwhelm. This fits into a picture of interlinked tribal communities that present the widely

accepted basis of Neolithic society at the time. It was imperative to balance competition and material gain, trading and raiding, fighting and feuding in order to preserve tribes and villages as well as the intergroup relationships needed to maintain them. However, fatalities did occur as well, and in the case of Warburg III even provide evidence for larger-scale intergroup violence, indicated by the presence of several individuals with fatal injuries from the same monument. Unfortunately, not all of the remains from the Warburg complex could be attributed to individual monuments, making a comparison of injury frequencies between the different monuments difficult. A number of individuals were radiocarbon-dated but calibration for the period is problematic and the date ranges obtained were rather broad. Still, the presence of a number of broadly contemporary individuals with traumatic injuries suggests that a larger-scale violence event, such as a raid or organized battle with a higher casualty rate may have taken place.

CONCLUSIONS

The analysis and comparison of assemblages from Altendorf, Warburg, and Erwitte-Völlinghausen has provided important new evidence on interpersonal violence during the Wartberg cultural horizon. Violent interaction appears to have been a relatively common occurrence during the period, affecting men, women, and children and including different scales of violent interaction, from one-to-one fighting to larger-scale violent events such as raids or even battles. This period of apparently endemic violence is one archaeologically characterized by increasing regionalization in the material record. There is no doubt that interpersonal violence was a common feature of the later Neolithic in the region and its scale, practice, and consequences are likely to have had a noticeable impact on society.

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Interpersonal violence in the Late Mesolithic and Middle Neolithic in the Netherlands

Elisabeth Smits

ABSTRACT

Skeletal remains from three Late Mesolithic and Middle Neolithic sites in the Netherlands have revealed evidence for interpersonal violence. These sites represent 34 individuals in total. Injuries were inflicted either ante-mortem or peri-mortem and affected two male individuals from burials and one adult represented by an isolated bone. The manner of burial differed from the normal burial ritual. Isotope analyses have shown that these individuals were local, although non-locals were represented in the osteological record as well. Explanations for the violent actions involved may be related to individual conflict or organized fights between groups.

INTRODUCTION

During the last 10 years, several Late Mesolithic and Middle Neolithic sites have been excavated in the Netherlands. The physical anthropological study of the human skeletal remains has revealed some features, which can be associated with interpersonal violence. Although these manifestations are rare, so are human skeletal remains from this period, especially from the Late Mesolithic, and therefore worthwhile discussing here. Not only is evidence from

burials considered, but the loose scattered human bones originating from open areas and refuse zones of the sites concerned are also taken into account. Multiple explanations exist for this latter phenomenon, including the occurrence of disturbed graves, the existence of an above ground mortuary ritual, and the possibility that scattered bones represent the osteological remnants of violent actions. The goal here is to present the observed features for interpersonal violence in the Netherlands and thereby contribute to an overall inventory and overview for northwestern Europe during the Mesolithic and Neolithic period.

MATERIALS AND METHODS

The human skeletal remains from this period represent more than 150 individuals, covering a time span from roughly 5500 to 3500 cal BC (Smits and Van der Plicht 2009), most of which originate from the Middle Neolithic period. The sites of Swifterbant (Van der Waals 1977), Urk (Peters and Peeters 2001), and Ypenburg (Koot *et al.* 2008) represent 112 individuals, but they have either revealed no skeletal evidence for interpersonal violence or the preservation of bone material was too poor to facilitate these observations. The three sites of importance here are: Late Mesolithic sites at Hardinxveld-Giessendam (i.e. Polderweg (5450–5050 cal BC) and De Bruin (5250–4500 cal BC)), and the Middle Neolithic site at Schipluiden (3600–3400 cal BC) (Figure 11.1).

Based on published results, evidence of traumatic lesions on the bones is recorded. The description of these injuries involves distinguishing between ante-mortem, peri-mortem, and post-mortem manifestations (Walker 2001). Ante-mortem injuries are defined by signs of bone reaction and healing and, therefore, indicate survival of the individual. Peri-mortem trauma, inflicted at or around the time of death, is characterized by the absence of healing because the period of survival was too short to enable the start of the healing process. This type of lesion can be recognized by sharp edges because fresh bone still contains much collagen. Post-mortem damage can be distinguished by rough edges, due to loss of collagen, and sometimes area of lighter discolorations due to recent damage to the bones

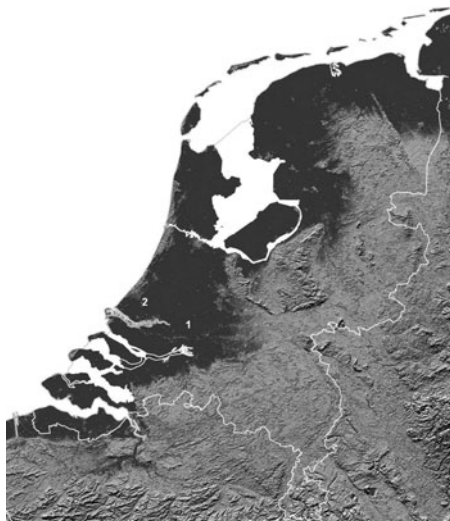


Figure 11.1. Map of the Netherlands with 1. Hardinxveld-Giessendam (Polderweg and De Bruin) and 2. Schipluiden (after Smits and Van der Plicht 2009).

(i.e. lack of patination). In other instances, bone changes are the result of poor preservation and soil pressure, causing lesions that are questionable in view of their shape and size and therefore classified as so-called pseudo-pathological damage.

The incidence of traumatic lesions is calculated here in several ways: (1) based on the minimum number of individuals per site; (2) according to sex; and (3) in relation to the involved skeletal elements. To explore the meaning of these skeletal injuries, information on burial customs, age, and sex is considered. Are males preferentially affected and, if so, could this indicate the existence of raiding bands or groups of warriors, or can these injuries also be associated with women and children, the possible victims of violent behaviour? Where stable isotope analysis data are available, the nature of the groups in terms of provenance and diet is integrated as well. This is to discriminate between local and non-local individuals and potential differences in diet between the two, which might also be related to the variation in mortuary practices.

SKELETAL EVIDENCE OF INTERPERSONAL VIOLENCE

Hardinxveld-Giessendam

Two of the sites comprising skeletal remains that are important to the topic of violence are the Late Mesolithic sites, Polderweg (5450–5050 cal BC) and De Bruin (5250–4500 cal BC) (Louwe Kooijmans 2001a,b; Mol and van Zijverden 2007). These sites are in close proximity to each other, both situated on river dunes, in an area now belonging to the municipality of Hardinxveld-Giessendam in the Dutch river area. The chronological sequence shows an earlier onset of the Polderweg habitation followed by an overlap with De Bruin and after that a continuance of De Bruin until the Early Neolithic period. Both sites may have been alternately used by the same group, which revisited and reused these sites during part of the year. The long occupation period and undoubted palimpsest formation prohibit determination of the exact periods and duration of habitation. The analyses of faunal and human remains point to the use of these sites as base camps inhabited mainly by family groups during the winter (Louwe Kooijmans and Smits 2001; Smits and Louwe Kooijmans 2001).

The formal burials in phase 1 of both sites and extensive variation in the toolkit of, in particular, flint and bone artefacts have led to the classification of these sites as base camps. At the end of habitation at De Bruin, the location might have served as a fishing camp. Based on the presence of raw materials, mainly stone and flint from extra-regional areas, the interaction sphere extends to the south of the Netherlands, Limburg, and the adjoining northern Belgian region.

De Bruin

Two graves and 10 isolated human bones were recovered from the excavated area. The minimum number of individuals for the various phases of occupation is seven (Table 11.1). The presence of one deciduous molar, although being of no significance for the mortality profile of this group, shows that children occupied the site as well and probably indicates the existence of complete households at this location.

The graves held the skeletal remains of two men. In grave 1, only the upper half of the skeleton was preserved due to ancient disturb-

Table 11.1. Minimum number of individuals (MNI) from various phases at De Bruin (adapted from Louwe Kooijmans and Smits 2001)

Phase	Individual	Sex	Age in years (approximately)	Skeletal remains (criteria for the establishment of the MNI)
1	1	Male	29–44	Grave 1 (upper half of skeleton)
1	2	Male	35–44	Grave 2 (more or less complete but fragmented skeleton)
1	3	Male	45–70	Cranium
3	4	Unknown	40–80	Cranium
3	5	Unknown	16–20	Metatarsal
2	6	Unknown	10	Deciduous molar
2	7	Unknown	>20	Clavicle

ance of the grave. This part of the skeleton indicates that the man had been buried on his back, although the position of the legs is unknown. In grave 2, the man had originally been buried in a sitting position.

This second individual is important in respect to injuries of a violent nature, as on his skull a well-healed depression fracture is present (Figure 11.2). On the dorsal–lateral right side of the head, on the right parietal bone near the lambdoid suture, a depression fracture is visible. The shape is more or less oval and measures 17×24 mm, with a longitudinal depression at the bottom. A blunt force weapon probably caused this injury. The original fracture is remodelled, the surface of the concavity being slightly porous with rather smooth edges, indicating a healing process, which clearly defines this injury as ante-mortem. The location on the skull shows that the blow came from a posterolateral direction, which means the attack came more or less from behind, out of sight of the victim's view. Postulating that this was an intentional attack with a deadly weapon, one can assume that it was a surprise attack, or ambush, meant to kill or at least incapacitate this man. However, he survived and was probably cared for by his group members. There is no apparent connection between this attack and cause of death, which might have been a natural one. The time lapse between this injury and time of death cannot be established, so the man's age at the time of this attack is unknown. The weapon could have been a kind of club made of wood, bone, or antler. No specific artefact, however, can be associated with this lesion.

The manner of his burial is remarkable, which is in a sitting position. This is unusual for this period, in which the most frequent burial position is supine and extended, as attested at Polderweg as



Figure 11.2. De Bruin: healed depression fracture (after Louwe Kooijmans and Smits 2001).

well as other Mesolithic sites in this part of Europe (Louwe Kooijmans 2009). It seems there could be a relationship with the social position of this individual here. It concerns the special sitting posture, as opposed to a position in which the deceased was laid down on the back or side as if resting. Was this man not supposed to rest, was he meant to be awake, watchful, perhaps serving as a guardian of the group? Could he have been a warrior or defender? These questions cannot be answered, but apparent traces of violence related with a male individual in the prime of his life and the deviant burial position cannot be ignored and might give meaning to the social organization of these groups with special task forces, one of which could well have been fighting and associated with conflict between groups.

Considering the available isotope data, which are restricted for this group, and until now only concern the diet, values of carbon and nitrogen show that his diet was comparable with the other man in grave 1. His isotope values fit in well with the distribution of both populations at Polderweg and De Bruin, which is also consistent with

the exploitation of regions with terrestrial as well as aquatic food sources. Although only diet isotopes were analysed there is no reason to regard him as an outsider (Smits and van der Plicht 2009).

In conclusion, it can be postulated that the man who died in the prime of his life had experienced and survived a violent attack from behind sometime during his life. The motive is difficult to establish, but the manner of burial is remarkable and might be connected with special responsibilities in society for certain individuals. Fighting and/or defending the group might just be one of them.

Polderweg

At Polderweg, two graves and 80 scattered human bones were recovered. One grave was complete and held the skeletal remains of a woman in an extended position, lying on her back. The other grave was disturbed and therefore no burial position could be derived. The group consists of a minimum of 12 individuals (Table 11.2). The age and sex determination revealed that men, women, and children were represented in the osteological record. Some of the isolated bones show signs of secondary burning and cut marks (Smits and Louwe Kooijmans 2001).

The attention here is focused on one of the isolated bones, the midshaft of a right clavicle with several cut marks on the anterior side (Figure 11.3). The repetitive character of the cut marks indicates a

Table 11.2. Minimum number of individuals from various phases at Polderweg (adapted from Smits and Louwe Kooijmans 2001)

Phase	Individual	Sex	Age in years (approximately)	Skeletal remains (criteria for the establishment of the MNI)
0	1	Female	40–60	Grave 1 (almost complete female skeleton)
0	2	Unknown	>20	Metatarsal
1	3	Unknown	>20	Grave 2 (incomplete skeleton)
1	4	Male	30–60	Cranium
1	5	Male	40–60	Cranium
1	6	Male	>20	Cranium
1	7	Female?	>20	Humerus (gracile)
1	8	Unknown	2–6	Incisive deciduous dentition
1	9	Unknown	10–15	Permanent dentition
1–2	10	Male?	>20	Humerus (robust)
2	11	Female??	>20	Cranium
2	12	Male?	>20	Femur (robust)



Figure 11.3. Polderweg: Cut marks on the anterior aspect of a clavicle (Smits and Louwe Kooijmans 2001).

deliberate action. Cut marks are also present on some other bones at this site but they cannot be assigned to specific actions, as they reveal no pattern. The observed repeated cut marks on the clavicle definitely stand out from the rest and deserve due attention in this discussion on violence. The pattern of cut marks consists of several long and, on the inferior part, several short cuts. The direction is diagonally from the inferior–medial to superior–lateral section and when considering anatomical position in the inferior–superior direction. The cut marks have been applied with a thin sharp object, comparable with a flint tool. The sharp margins show that the bone was fresh at the time the marks were made and in the absence of bone reaction, these cut marks are interpreted as peri-mortem. The robustness of the bone indicates an adult individual although epiphyses are absent and their state of fusion cannot be assessed, nor can sex be assigned. The clavicle fragment was among habitation refuse at the site in which other human isolated bones were also recovered. This bone does not represent a separate individual because of overlap with other skeletal elements from the same phase and age group and, therefore, is excluded from Table 11.2 with the minimum number of individuals.

As to the question of why these cut marks were made, their location near the head might indicate the cutting of sinews and connecting tissue to remove or separate the head from the rest of the body. Together with the finds of disarticulated skulls (without the

viscerocranial and mandibular sections) in the refuse deposits of this site, this seems to be the most obvious interpretation. Similar cut marks have elsewhere been associated with decapitation (Smith and Brickley 2004). So the presence of several isolated skulls might be explained by this; and perhaps one of them initially belonged to the same individual. It is possible that scattered bones originate from disturbed burials but in this case, it would not explain the cut marks. A head cult either for the exposition above ground of the skulls of ancestors or slain enemies, or the possibility of skulls posted on stakes to form a so-called death fence or symbolic shield to ward off enemies are some possibilities that could explain the presence of disarticulated cranial remains; however, this cannot be proven. Three of the isolated skulls belong to male individuals and one possibly to a female.

The carbon and nitrogen ($^{13}\text{C}/^{15}\text{N}$) isotope values are in accordance with those of the whole group (Smits and van der Plicht 2009). The Hardinxveld-Giessendam population shows up as very homogeneous considering their diet. It is not possible to allocate this individual as local or non-local according to the isotopic signature. Tempting hypotheses concerning locals would be an above ground ritual preserving the heads of ancestors and in the case of non-locals the collecting and exhibition of skulls as 'war trophies'. Both rituals would have led to the dispersal of human bones.

In summary, an adult individual represented by the clavicle was probably decapitated *peri-mortem*, after which the skeletal remains ended up in the occupation deposits at *polderweg*. The cause of death is unknown and the manner of disposal of the bones could be related to either a special mortuary ritual, which took place above ground, or to the remnants of the decapitation practices, perhaps of slain enemies, in which skulls served as trophies for a while, after which they became embedded between the habitation debris.

Schipluiden

Located on a small dune in the coastal region near the village of Schipluiden is a small burial ground from the Middle Neolithic period, ca. 3600–3400 BC (Louwe Kooijmans and Jongste 2006). Apart from the burials, 36 isolated human bones were recovered from a dune. Further findings include settlement features from which the occupation by several households can be derived. Based

Table 11.3. Minimum number of individuals from all phases at Schipluiden (adapted from Smits and Louwe Kooijmans 2006)

Phase	Individual	Sex	Age in years (approximately)	Skeletal remains (criteria for the establishment of MNI)
2	1	Male	38–45 years	Skeleton in grave
2	2	Male	59–65 years	Skeleton in grave
2	3	Male	46–49 years	Skeleton in grave
3	4	Male	41–50 years	Skeleton in grave
2	5	Male	25–40 years	Skeleton in grave
1–2a	6	Unknown	8 years	Skeleton in grave
2	7	Unknown	2 years	Skeleton in grave
2a	8	–	Adult	Ulna (left)
2a	9	Male	25–35 years	mandible + molars
2a	10	–	10–11 years	Molar
2b	11	Male	adult	Cranial fragment
2b	12	Female?	17–25 years	Cranial fragments + molars
3	13	–	9 months	Molar
3	14	–	30–60 years	Cranial fragment
3	15	Male?	17–25 years	Femur and molars

on the zoological and botanical remains the site was occupied all year. Trade connections with southern regions can be deduced from the material culture.

The burial ground contained six graves, including one double grave. The minimum number of individuals amounts to 15 when the isolated scattered bones are taken into account (Table 11.3). The group consisted mainly of men and children, only one isolated bone could be tentatively assigned to a female individual (Smits and Louwe Kooijmans 2006).

The deceased were positioned in the graves with flexed limbs, which at the time of interment were possibly tied. An exception is the double grave that contained the skeletons of two men (Figure 11.4). They were interred in one act as proven by overlapping of the limb bones. The first individual, a man 38–45 years old was positioned on his back, the second man (59–65 years old at death), was laid down afterwards in the remaining space of the pit, on his back with his left leg flexed. This second man is of interest here as a large impact fracture can be observed on his skull (Figure 11.5).

On his frontal bone, a semicircular lesion is present covering the inferior part of the frontal bone up to both eye sockets. The lesion involves the nasal and lacrimal area and left zygomatic bone. The edges of the lesion are sharp, indicating damage to ‘fresh’ bone, and



Figure 11.4. Schipluiden: double grave (Smits and Louwe Kooijmans 2006).

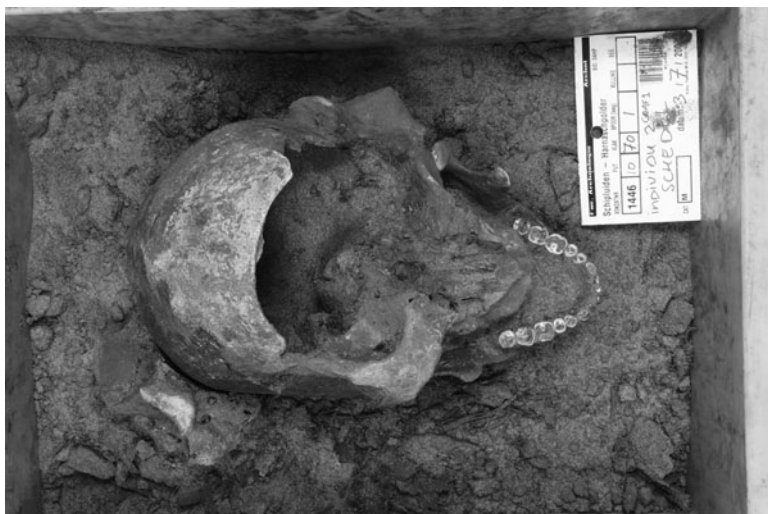


Figure 11.5. Schipluiden: detail injury on skull (after Smits and Louwe Kooijmans 2006).

no sign of bone reaction or healing is observed. This leads to the assumption that damage was caused peri-mortem.

This injury was discovered during excavation and studied in detail to exclude post-depositional or excavation damage. While excavating, the glabella and nasal and left orbital region were discovered on the left lateral side of the cranium, intact as if removed in one piece. Other fragments of the frontal bone were discovered at the bottom of the skull, after emptying the soil from the cranial vault, which had been filled in after decay of the brain tissue. These fragments were resting on the inner table of the occipital bone. Furthermore, other fragments of the frontal bone, including the right orbital margin were located at the right lateral side of the skull. What can explain the phenomenon in which various anatomically adjoining bones from the viscerocranium and frontal bone ended up in different locations? When imagining a frontal blow to the head with apparently such a great force as to shatter the bone, perhaps bone fragments were adhering to the damaged skin, which could still have hung around in flaps. This could have resulted in the observed dispersal of these fragments at the left and right side of the skull as well as within the cranial vault itself, after which it was filled in with earth through time. Although gruesome to imagine such an attack, this scenario provides the best explanation for the position of various skeletal elements. Post-mortem damage brought on by, for instance, pressure from above would have led to either the presence of all the concerned fragments at the bottom of the skull, or, depending on post-mortem interval, still visible on the outside but crushed inwards.

This frontal attack might have been inflicted during a fight between groups, hence the presence of the second individual who might have been a victim as well. If it had been a combat between these two persons as opponents, during which both died, their burial in one grave would seem questionable. Apart from this, the age of the second individual is worth noting, he must have been one of the oldest persons in the group and one wonders why he was fighting.

Isotope values of strontium, oxygen, and lead of tooth enamel classify both individuals as locals. This is true for all individuals in the graves, in contrast to several loose molars from the refuse zone, which seem to have belonged to non-locals (Smits *et al.* 2010), from areas to the east and south several hundreds of kilometres from Schipluiden.

It can be concluded that we are dealing with one, and possibly two victims, of interpersonal violence. Only one, however, shows skeletal evidence for violence. Injuries that only affect the soft tissue do not necessarily show on the skeleton, therefore introducing a bias in prevalence rates for violent trauma, which in reality may have been much higher. It appears that all individuals who were buried in the graves were of local provenance, whereas outsiders were in some cases indicated by isolated molars. Whether other isolated bones originate from local or foreign individuals remains unknown, as only the analysis of dental enamel provides information on the phenomenon of provenance. The reason why scattered remains of non-locals were deposited above ground instead of buried can be related to a different ritual or discarding of remains of slain enemies.

DISCUSSION

Skeletal trauma is essential to the study of violence in past societies. We know, however, that the prevalence of violent actions and their associated victims is biased and underrepresented due to several factors. The frequency of injuries to soft tissues is unknown and the state of preservation of skeletal remains is crucial to study the nature of bone lesions. The number of casualties due to violence, of either victims or perpetrators, whose remains might have been treated differently, is obscured or not observable at all in the archaeological record because of the possibility that remains became dispersed above ground.

The incidence of recorded skeletal injuries is calculated regarding the minimum number of individuals per site, according to sex and in relation to the specific skeletal element (Table 11.4). Although one case is known per site, the prevalence in respect to the minimum number of individuals varies and shows the highest rate for De Bruin and lowest for Schipluiden. According to the ratios for sex and specific bones they are even higher, but meaningless because of the small samples. As the evidence for interpersonal violence is very rare and biased, it is difficult to draw major conclusions for whole populations and periods, and so these data for now, mainly serve as an inventory.

Table 11.4. Incidence of skeletal traumatic lesions

Site	Graves*	Individuals*	Dispersed*	MNI*	Skeletal trauma	% MNI (skeletal evidence)	% per element (skeletal evidence)	% per sex or age group (skeletal evidence)
Hardinxveld-De Bruin	2	2	10	7	Cranial trauma, healed	14.29%	25% (cranial remains only)	33.33% total number of males
Hardinxveld-Polderweg	2	2	80	12	Cut marks on clavicle, unhealed (unarticulated)	8.33%	50% (clavicle remains only)	10% total number of adults
Schipluiden	6	7	36	15	Cranial trauma, unhealed	6.67%	20% (cranial remains only)	12.5% total number of males
Total	10	11	126	34	3	Mean = 9.67%		

*Adapted from Smits and van der Plicht (2009).

Factors for better understanding the background to these data include the burial ritual and relation of the latter with the treatment of local and non-local individuals by means of isotope research.

The special deposition of the deceased, which is associated with interpersonal violence, stands out from normal burial practices. The 'survivor' at De Bruin was buried in a sitting position, which is rare and might be related to a special function this individual had in the daily life of the community. In Schipluiden, the double grave with the deviating burial posture also stands out from other burials. The two men in grave 1 were both locals, but there is a deviation from normal burial practice in the way they were positioned in the grave, as well as the fact that all other graves were single inhumations. One can suggest that an unnatural death leads to deviant rituals in handling the dead. In accordance with this is the unusual mass burial from the Early/Middle Bronze Age at Wassenaar. Here, a large burial pit contained the skeletal remains of 12 individuals, consisting of six men, four children, and two women. The presence of a flint arrowhead in the thoracic region of a male individual and a number of traces of cutting blows on several other males pointed to a violent death. As the overlapping of limb bones indicated a simultaneous burial for the whole group it was concluded that all individuals probably suffered a violent death (Smits and Maat 1993). Although this concerns a burial from another period, the relation with violence and deviating burial practices seems to be a common phenomenon. It also demonstrates that in Dutch prehistory, violent actions differ in scope from relatively small-scale incidents with one or two casualties, as discussed above, to the murder of family groups, as was probably the case in Wassenaar.

The meaning of scattered bones is more difficult to explain. In Polderweg these bones occasionally display scorching and cut marks that can result from different processes, one of which could be violence related. The reason for the occurrence of loose, isolated bones can be diverse, and range from the disturbance of graves, as we have seen in both Polderweg and De Bruin, to an above-ground mortuary ritual associated with either group members and/or outsiders. In the last case, evidence exists for some individuals from Schipluiden, whose remains ended up disarticulated and scattered in refuse zones among other habitation debris. Although the explanation is ambiguous, it is advisable to include these bones, especially dental elements, in the isotope analyses to detect non-local individuals.

CONCLUSIONS

The known cases of violent injury dating to the Neolithic comprise only two and possibly three instances of skeletal trauma. The occurrence varies between 6.7% and 14.3%, with a mean of 9.67% in view of the minimum number of individuals. Originally, this rate must have been much higher considering the bias in recording possibilities and influence of taphonomic factors. One can conclude, however, that violent actions possibly took place regularly and that mostly men were involved. No chronological trends can be observed based on these few events, neither can organized warfare, but intentional interpersonal violence is attested at De Bruin and Schipluiden where fatal wounds were intended and inflicted on the victims.

The treatment of the dead might be related to social aspects such as a special position in society but also to the cause and manner of death. Therefore, this type of research should incorporate the socio-cultural background and features such as burial type and position of the dead in the grave as well. The study of provenance by way of isotope research also can bring more depth to the discussion of violence by discerning between local and non-local individuals and help to understand whether and why these people were treated differently.

Neolithic violence in France: an overview

Alain Beyneix

ABSTRACT

The emergence of war during prehistoric times is a recurrent subject that has often been treated in archaeological literature. The present contribution, in light of a synthetic analysis of traces of violent death observed in Neolithic graves in France, raises the issue of the emergence of a real climate of collective violence in the first farming communities in Europe. Nevertheless, it seems premature to label these as fights between populations. In fact, this collective violence probably constituted early beginnings of the authentic war that emerged only during the Bronze Age, with the appearance of a specific set of weaponry—particularly defensive—and when a military caste emerged in society.

INTRODUCTION

The question of the origins of war in France is a very old one, as old as prehistoric science. It was brought up to date recently (Beyneix 2007). The first scholars who wrote about violence in prehistory were indisputably Doctors Prunières and Baron de Baye. In fact, their excavations of Neolithic collective graves in the Grands Causses du Gévaudan region (mainly in the burial cave of Les Baumes Chaudes at Saint-George-de-Lévezac and in the dolmen of La Plaine de l'Amède at Chanac) and in the department of Marne (especially in



Figure 12.1. Flint bladelets set in vertebrae, artificial caves of Coizard and Villevénard (Marne). Photo J.-G. Berizzi.

the artificial caves of Coizard and Villevénard) have helped establish very important collections of anthropological material. Among these bones, they could detect many traumatic lesions, primarily caused by arrows (de Baye 1873; Prunières 1879, 1882) (Figure 12.1). During the same period, other researchers in Rouergue (Lalanne 1874), Provence (Cazalis de Fondouce 1878) and Languedoc (Sicard 1900) mentioned on an *ad hoc* basis similar pathological cases. These observations generated a literature that includes books and journal papers (Le Baron 1881; Nadaillac 1881; Le Double 1911; Pales 1930; Morel 1934; Stéphen-Chauvet 1936; Morel 1944).

Most authors considered that the origins of war were to be found in the Neolithic period, with the birth and development of the first agropastoral societies; in other words, when demographic pressure and the prospecting of soils for cultivation had caused the first conflicts between communities. This sedentary society, governed by cultivation, was frequently contrasted with the peaceful life of hunter-gatherers in the Palaeolithic, without pressure, when people found their resources in the environment. Sometimes, this life was compared with a golden age of humanity (Camps 1982; Stoczkowski 1994).

This idyllic view, barely caricatured here, has had its day because it is not realistic. First, the scarcity of skeletal material does not permit an assessment of the peaceful, or otherwise, life of Palaeolithic men. In Europe, only some 20 burials are attributable to the Middle

Palaeolithic and 100 for the Upper Palaeolithic (Binant 1991). Therefore, the list is very short and traces of possible deliberate wounds in the form of bone fractures or head injuries are distinguished from accidental lesions only with difficulty, and particularly in societies that did not yet seem to use the bow. Moreover, among more recent hunter-gatherers of the Epipalaeolithic and Mesolithic, cases of violent deaths are well established in several regions of the Old World (Newell *et al.* 1979; Vencel 1991). In France, the individual in burial K at Tévéc (Morbihan), which presented two arrowheads embedded in the sixth and 11th vertebrae, is a striking example (Péquart *et al.* 1937). On the other hand, injuries at this time nearly always relate to individual cases scattered in the cemetery.

THE PRESENT STATE OF KNOWLEDGE FOR THE NEOLITHIC

Today in France, about 60 Neolithic sites have revealed bones exhibiting injuries, fatal or slight, mainly caused by arrows (Cordier 1990; Guilaine and Zammit 2001, pp.339–349). On the other hand, the study of cranial injuries is less well developed and only a few examples have been mentioned in the literature, some of which are noted below. Two groups of arrow wounds can be observed. In the first group, the bone tissue has healed all around the projectile and this proves the survival of the wounded person. In the second group, the arrowhead is embedded in the bone with no sign of healing, indicating that the subject died as the result of the injury. The discovery of this evidence is closely dependent upon careful research in funerary archaeology. Overall, very few graves have furnished any evidence of intentional wounds caused by weapons. Nevertheless, one has to look at things in perspective and take into consideration that it is very difficult to determine possible fatal wounds inflicted on muscles, viscera, or internal organs. Nor are we unaware that many deceased were denied burial and that many victims were certainly left on the battlefield.

For the Early and Middle Neolithic explicit evidence of war-like trauma is not common. At present, we do not know of any cases from the Early Neolithic in southern France. Only two Linear Pottery Culture (or Linearbandkeramik; LBK) cemeteries,

Hoenheim-Souffelwersheim and Quatzenheim in Alsace, each furnished an adult individual wounded by an arrow. In the first cemetery, grave E contained a man whose left knee joint presented a healed wound around a triangular arrowhead (Forrer and Jängger 1918). The man in grave 10 of Quatzenheim had a triangular arrowhead in the right ilium; again, the subject survived insofar as the wound had healed (Steiber 1955).

Excavations at the Pontharaud cemetery, Auvergne, dated to the transition between the Early and Middle Neolithic (ca. 4500–4300 BC), revealed a tomb containing several bodies deposited at the same time. Most of the five men and two adolescents lay face down. The death of the seven subjects and their burial seem to have been produced simultaneously, as shown by the stacking of corpses and tangled limbs (Loison 1998). However, only one individual was indisputably killed violently by an arrow. In the fifth and fourth millennia BC, in a Chasséen context, a single man found in a grave in the Villeneuve-Tolosane-Cugnaux settlement (Haute-Garonne), must have been the victim of a murder (Beyneix 2003, pp.200–201). A sharp arrowhead found in the lower part of the vertebral column can explain the death of the person, who would have been struck through the viscera. For the Late Neolithic of west-central France, there are three double tombs at Les Châtelliers du Vieil-Auzay (Vendée), dating from the second half of the fourth millennium BC (Birocheau *et al.* 1999; Large *et al.* 2004). Each contained two young men or adolescents. The bones presented with marks of multiple blows, particularly on the skull (Figures 12.2 and 12.3). Several resulted in death. In addition, the two victims of tomb 3 had each received an arrowhead in their trunk (Figure 12.4).

During the Final Neolithic–Chalcolithic, between 3500 and 2200 BC, the clearest and most abundant evidence of violent deaths are seen in collective graves (burial caves, artificial caves, dolmens). The two main relevant regions in France are in the south (Beyneix 2003, pp.198–210), with an important concentration in the Grands Causses du Gévaudan region (the cave of Les Baumes Chaudes at Saint-Georges-de-Lévezac produced 18 arrows injuries in a collection of some 300 individuals) (André and Boutin 1995) and the department of Marne. Currently, there is no detailed inventory of traumatic lesions listed in France. Nevertheless, we wish to make clear the general character of these anthropological collections. All parts of the body could have been hit, but most identified wounds concern



Figure 12.2. Violent impact on the left parietal bone of individual no. 4 (grave 2) of Les Châtelliers du Vieil-Auzay (Vendée). Photo P. Birocheau and J.-M. Large.

stomach muscles, pelvis, and lower limbs (lumbar vertebrae, ilium, sacrum, femur, and tibia). Frequently, arrow injuries to the long bones have obviously healed. We can cite two examples: a tibia fragment found in the dolmen of Font-Rial at Saint-Rome-de-Tarn (Aveyron) (Baudrimont 1875) (Figure 12.5), and a tibia and a metatarsal discovered in cave I of Les Cascades de Creissels (Aveyron) (Baldet 1965). On the other hand, arrow injuries to the vertebral column resulted in rapid death. The examples are numerous. Among others are a vertebra from Gijounet (Tarn) (Zammit 1991), a vertebra with a deeply set arrowhead collected from the cave of Sainte-Enimie (Lozère) (Morel and Baudouin 1928), and traumatic lesions from the artificial cave of Le Castellet, Fontvieille (Bouches-du-Rhône) (Cartailhac 1892) (Figure 12.6). These observations are not surprising: even aside from serious vascular lesions, an arrow (arrowhead and shaft) penetrating the abdomen or thorax will cause serious visceral damage and microbial infection with incurable complications.

Figure 12.3. Skull of individual 6 (grave 3) of Les Châtelliers du Vieil-Auzay (Vendée). The face shows a very violent impact, fracturing the mandible and the nose. The maxilla was cracked and the upper incisors were broken. Photo P. Birocheau and J.-M. Large.



Figure 12.4. Individual 6 wounded by an arrow, grave 3 of Les Châtelliers du Vieil-Auzay (Vendée). Photo P. Birocheau and J.-M. Large.



Figure 12.5. Arrow injury on a tibia, dolmen of Font-Rial at Saint-Rome-de-Tarn (Aveyron). Photo A. Roussot.

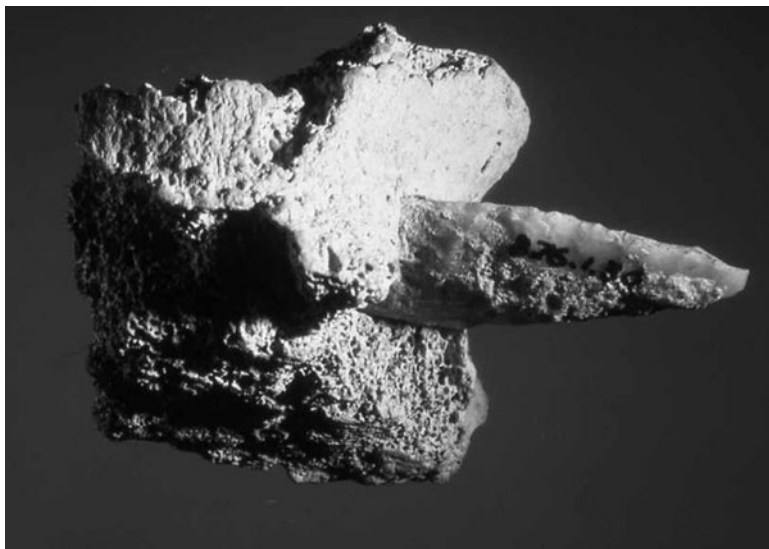


Figure 12.6. Vertebra with embedded flint arrowhead, artificial cave of Le Castellet, Fontvieille (Bouches-du-Rhône). Photo M. Martin.

As we have underlined several times, the bow remained the main weapon used during such conflicts. Furthermore, in the Grands Causses du Gévaudan region, during Final Neolithic, arrowheads with peduncle and wings called 'en sapin' were particularly used many wounds attest (Costantini 1984). However, some examples of hand-to-hand conflict are known. The best evidence is a section of vertebral column found in the burial cave of Pas-de-Joulié at Trèves (Gard), which presented as a copper dagger blade embedded in a vertebra (Figure 12.7). Another example is a skeleton from the artificial cave of Les Boileau, Sarrians (Vaucluse). The subject exhibited in the frontal bone is the imprint of a small stone axe (Figure 12.8) (Mahieu 1992). Analysis of anthropological materials from excavations in the burial caves of La Médecine at Verrières (Aveyron) has revealed two skulls with marks of violent conflict caused by blunt instruments (Boutin and Escola 1995). It is obvious that the most efficient way of thwarting an enemy during hand-to-hand combat was to strike at the head. As a rule, head wounds are more serious than those received to others parts of the body.

Excavations in 1965 and 1966 in the artificial cave of Roaix (Vaucluse) displayed two distinct funeral levels dating to the Final Neolithic-Chalcolithic. Only the upper level, also called the 'war

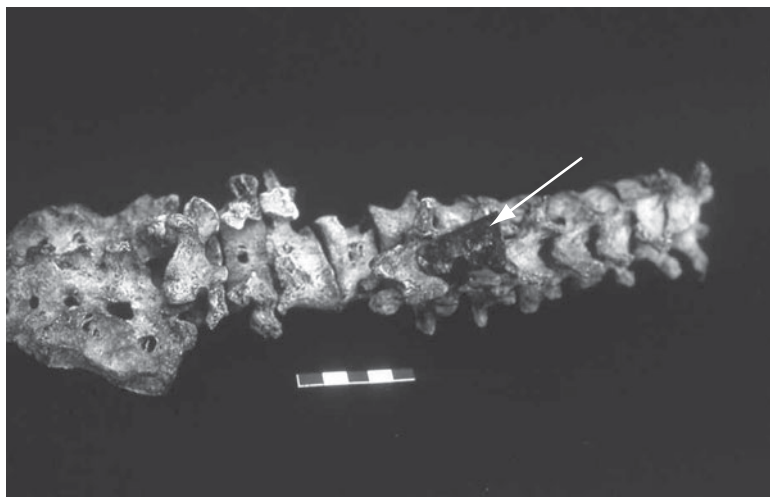


Figure 12.7. Copper dagger blade set in a vertebra, burial cave of Pas-de-Joulié at Trèves (Gard). Photo G. Costantini.



Figure 12.8. Wound in the frontal bone caused by a small stone axe, artificial cave of Les Boileau, Sarrians (Vaucluse). Photo E. Mahieu.

level', attests a murderous dispute (Courtin 1974; Sauzade 1983). This level contained skeletons in perfect anatomical articulation all deposited simultaneously (Figure 12.9). Only half of the grave remained, the other half having been destroyed by erosion and illegal excavations. In the beginning, 60 or 70 subjects lay at this level. Men, women, and children had been crowded together, hastily, often head to foot. The numbers of men and women were approximately equal, and adults made up about 60% of the total. A score of arrowheads were found scattered at this level, of which seven were discovered embedded in different parts of the body (Figure 12.10) or found in the ribcage, the muscles, viscera, and internal organs having disappeared (Figure 12.11).

SOME REMARKS ABOUT NEIGHBOURING COUNTRIES

A series of recent discoveries in Germany and Austria raise the question of an atmosphere of collective violence near the very start of the Neolithic, during the end of the sixth millennium BC and the



Figure 12.9. Skeletons in perfect anatomic connection deposited together at the same time in the 'war level' of the artificial cave of Roaix (Vaucluse). Photo J. Courtin.

beginning of the fifth millennium BC. These discoveries are still very few, but their exceptional character clearly shows a failure of peaceful social mechanisms within the first peasant communities (Wild *et al.* 2004). The most famous case is Talheim in Baden-Württemberg (Wahl and König 1987, Wahl and Trautmann, Chapter 5, this volume). In 1983, investigations revealed an important bone concentration in a common grave. The remains were amassed in a chaotic manner and corresponded to complete, perfectly preserved skeletons. Thirty-four subjects were piled in this mass grave. Most corpses were lying flat on their stomachs, with limbs in all directions. Other corpses were lying on their backs or sides. Sixteen children and adolescents and 16 adults (nine men and seven women) were counted. Deep traumatic



Figure 12.10. Arrowhead discovered embedded in a pelvis, from the 'war level' of the artificial cave of Roaix (Vaucluse). Photo J. Courtin.

scars were identified on several skeletons. The bones presented marks of violent blows concentrated on the skulls. These fatal blows corresponded to wounds caused by axes or adzes of polished stone, tools used by these farming communities. Members of two families, at least, men, women, and children had been murdered irrespective of age or sex (Alt *et al.* 1995). The massacre, which we can call a systematic execution, took place as a single event. Then, corpses had been carelessly thrown into the common grave. Excavations in the large LBK settlement of Vaihingen, in the Neckar region, revealed some 80 burials in the ditch (Krause *et al.* 1998; Bentley *et al.* 2003, 2004). Several examples show that some corpses had been treated unceremoniously. In the Palatinat, investigations in a Neolithic village at Herxheim revealed remains of several hundred people in ditches. More than 300 skulls and top parts of the skull were found, some of these having been brought together in groups of three to five. Most skulls, particularly children's, exhibited fractures and cut marks (Lontcho 1998; Dürrwächter *et al.* 2006). An anthropological study of one of these skulls proved that the subject had received several violent blows on the frontal bone and occipital. After death, scalps had been methodically torn to break the circumference of the skull, just to conserve the top part. Finally, in Austria, excavations on the very important Neolithic settlement at Asparn-an-der-Zaya revealed, in the settlement's enclos-



Figure 12.11. Arrowheads founded scattered in the ‘war level’ of the artificial cave of Roaix (Vaucluse). Photo J. Courtin.

ing ditches, more than a hundred skeletons (Windl 1998; Teschles-Nicola, Chapter 6, this volume). The majority of corpses had been laid flat on their stomachs, some crammed together suggesting lack of respect. The osteological study detected a series of mortal injuries, principally on the skulls, caused by axes and adzes of polished stone. The victims, unlike Talheim, were not buried but only thrown in village ditches. In addition, dog or wolf gnawing was observed on the bones indicating that corpses had remained exposed for some time in the open air before ditches were backfilled.

What sort of lessons can one learn from these discoveries? Overall, we note that these aggressive actions all occurred at the end of the sixth millennium BC and were produced by the same civilization: the

LBK. Graves for the deceased do not correspond to typical funerary practices observed in the Danubian Neolithic, which favours individual burial. Usually, the subject rested in a flexed position, with the legs turned on the left side (Jeunesse 1997). However, similarities must be underlined: a village community or a familial clan had been decimated regardless of age or sex. In addition, the marks observed on the skeletons show evidence of exceptional violence. Jean-Paul Farrugia evoked a major crisis. Cohabitation and confrontation of the old and new worlds originate in this crisis, which sets off colonization of new land (Farrugia 2002). As far as we are concerned, the exact causes of such events remain unknown.

Recent research in the Iberian Peninsula has revealed some examples of subjects injured by arrows during the Neolithic. At present, the earliest evidence of collective violence dates between 4000 and 3500 BC. There are two men found in two cemeteries of the Sepulcros de Fosa culture: the sites of the Bovila Madurell at Sant Quinze del Vallès and of Can Grau at the Roca del Vallès. The first individual had succumbed to an arrow embedded in a lumbar vertebra (Campillo *et al.* 1993). The second had received an arrow wound, not fatal, in a dorsal vertebra (Marti *et al.* 1997, pp.233–234). For the Final Neolithic, we can cite the sepulchral rock shelter of San Juan ante Portam Latinam in the north of Spain. The site furnished some 50 skeletons dated between 3500 and 2800 BC. An anthropological analysis showed that nine men had been injured by arrows (Vega *et al.* 1999; Chapter 15, this volume). Excavations in the artificial cave of Longar at Viana, in Navarre, revealed four subjects wounded by arrows. Only one had not received a fatal injury (Armendariz *et al.* 1994; Armendariz and Irigaray 1995). Lastly, in Catalonia, most subjects of the artificial cave of La Costa de can Martorell must have been the victim of aggressive actions. A ballistic examination of arrowheads found scattered in the funeral chamber can explain the death of many subjects hit in muscles, viscera, or internal organs (Mercadal and Fernández 2003).

Radiographs and computerized axial tomography of the body of the ancient Alpine Iceman (dubbed 'Ötzi' and dated between 3300 and 3200 BC) revealed a flint arrowhead lodged in the left side of his chest. Examinations also revealed the extent of damage that the arrow had done. A flint arrow had hit the subject in the back and torn through nerves and major blood vessels. The arrow had shattered his left shoulder blade and stopped within an inch of the left

lung (Gostner and Egarter Vigl 2002; Gostner *et al.* 2004). Recently, the mummy underwent multislice computed tomography examination. The left dorsal subclavian artery contours show a 13-mm-long section where the vessel wall is damaged. This is a typical complication of a laceration of the subclavian artery. In the surrounding soft tissue, a large haematoma is visible. The cause of death by an arrowhead leading to deadly haemorrhagic shock is confirmed (Pernter *et al.* 2007). The study of DNA samples gathered from the Iceman's weapons, tools, and clothing, indicated that they contained blood from four different individuals others than Ötzi. The blood on an arrow found with the Iceman came from two individuals. The blood on the knife blade carried by the Iceman belonged to a third individual. The research also showed blood from a fourth individual on the left side of the Iceman's goatskin coat (Loy *et al.* 2003). These different analyses suggest that Iceman had been in a combat situation between 24 or 48 h before he died and that he had been killed by the arrow shot into his back.

CONCLUSION: THE BEGINNINGS OF WAR IN WESTERN EUROPE

Even if in the last hunter-gatherer societies we can observe evidence of violent death caused by conflict between communities, the first manifestation of real collective violence appeared in Europe during the Neolithic. The common grave and mass graves remain the best evidence. It is during the same period that it is possible to perceive the development of the male warrior identity, with offensive weapons taking a prominent role. The number and typological range of arrowheads increased in the Final Neolithic-Chalcolithic while the part of hunting in the diet was in decline since the beginning of the Middle Neolithic. Simultaneously, in graves, we noted the presence of many arrows near the corpses, in what must have been quivers. For example, investigations during the 1960s in artificial cave 2 of Les Mournouards at Mesnil-sur-Oger (Marne) produced 96 arrowheads packaged in groups ranging from 7 to 12. From their position, quivers must have been suspended from the belt or carried over the shoulder, the arrows upside down (Leroi-Gourhan *et al.* 1962). It is the same for excavations in the Remedello cemetery in northern Italy, where some

graves contained arrowheads packaged in quivers (Cornaggia Castiglioni 1971). Consequently, it is evident that the proliferation of these projectiles, initially assigned to the hunt, traces the formation of a warrior kit.

The establishment of a food-producing economy by the first farming communities caused tensions and violent clashes between communities. In fact, the stockpiling of wealth and constitution of reserves, in the form of agricultural stocks or herds, probably engendered much covetousness. This climate of violence was equally continued by settling down more permanently and by the start of the concept of frontier or border regions. The implantation of villages in the heart of the best soils and possession of land, motivated by the quest for new pastures and fertile fields, represented subjects of tensions and dissension between neighbouring populations.

Aggressiveness seems controlled and directed at the same time; the murder punished in the community becomes on the other hand trivialized and encouraged if it is exerted against an enemy. Therefore, this collective violence remained subject to the control of the group or its leader. In addition, war-like tendencies seem more important in societies with social inequalities. We emphasize that the first indications of social grading and of power emergence appeared during the Middle Neolithic in western Europe (Guilaine 1996). From that moment on, increasing violence during the Neolithic can be attributed to several factors: material causes in relation to disputes over territorial boundaries, economic motivations to permit forcible seizure of wealth or valuable objects by incursions, raids, and razzias and, finally, social reasons, because victorious conflicts are a demonstration of the strength of one community against another, and they confirm the prestige of the group or chief.

However, in the end the recognized or established examples of violent death and slaughter remain very few within the first farmer and peasant communities in western Europe. They do not justify the hypothesis of armed disputes on a large scale. We cannot speak of 'war', which fits in with what Jean Courtin has written about war during the Neolithic (Courtin 1984). Actually, this collective violence is the early beginning of real war in this definition, that is to say an aggressiveness organized, managed, socialized, and used for the group at the expense of a neighbouring group, referred to other implications (Beyneix 2001, 2007). War is established notably by specific armaments adapted to hand-to-hand and to collective

combat. Now, the first weapons to present this character are defensive armaments (helmets, cuirasses, and greaves) and offensive armaments (spears, swords, etc.). They appear during the Bronze Age only. We can add the function of the horse. The use of horses is observed during the end of the Bronze Age only (pieces of harness, elements of chariots, etc.). Moreover, a society dedicated or consecrated to war includes a military caste or a military aristocracy. Once again, the appearance of a war-like elite is not discernable before the beginnings of the Bronze Age. To conclude, and just to cite one example, in the ancient Near East the real war to conquer lands, valuable objects, or captives, was a large-scale campaign, organized and supported by a perfectly structured army. Real war dawned only with the first Bronze Age empires.

ACKNOWLEDGEMENTS

I am very grateful to the researchers, colleagues, and friends who permitted me to use photos from their own research to illustrate the present contribution.

Skeletal evidence for interpersonal violence: beyond mortuary monuments in southern Britain

Rick J. Schulting

ABSTRACT

This chapter considers the various depositional contexts in which human remains with (and without) evidence for trauma attributable to interpersonal violence have been found. Previous studies have been biased towards the long barrows and chambered tombs of southern Britain. The possibility of regional variation in the prevalence and forms of violence requires that other parts of Britain are investigated, with some preliminary indications that trauma is as common, if not more so, in northern England as it is in the south. The difficulties of attributing individuals from non-mortuary contexts to the Neolithic are discussed. Systematic programs of AMS ^{14}C dating are needed to address possible differences relating to mortuary context. While it remains difficult to place these results into a population perspective, a number of incidences of violent trauma have been observed on individuals from caves, directly dated to the Neolithic.

INTRODUCTION

A previous paper on violence in Neolithic Britain (Schulting and Wysocki 2005) summarized the then available skeletal evidence on a pooled sample of some 350 'composite' crania, deriving primarily

from long barrows and chambered tombs in southern Britain. While making a useful contribution to the investigation of Neolithic violence, this study suffered from a number of biases: first in terms of regional coverage, with a focus on the south; secondly in terms of chronology, as these monuments date primarily to the earlier Neolithic, ca. 3800–3400 cal BC; and thirdly in terms of context (i.e. monumental mortuary structures). The purpose of the present contribution is to begin to redress this imbalance, by discussing Neolithic skeletal collections in other regions of Britain, and by considering different monumental contexts, and monumental versus non-monumental contexts. As will be seen, this is far from a simple task, but it is an important one none the less, as it is impossible to recognize and interpret variation in the nature and extent of interpersonal violence in the Neolithic, in both Britain and elsewhere, without considering these factors. This is part of an ongoing project, and the results presented here are preliminary. The focus is on cranial trauma, partly for historical reasons (most of the available assemblages dates from the nineteenth and early twentieth centuries, when crania were often retained while postcranial material was not), and partly because cranial trauma is more likely to result from interpersonal violence, while postcranial trauma is more likely to relate to accidental injury.

A BRIEF OVERVIEW OF CRANIAL TRAUMA

Cranial injuries in Neolithic contexts take the form of healed (ante-mortem) and unhealed (peri-mortem, occurring at or near the time of death) injuries. Most can be described as blunt force trauma, though polished stone axes can result in what can be termed semi-sharp force injuries (cf. Fibiger 2009). Because of the shape of the cranium—which tends to deflect objects unless striking perpendicular to the bone—penetrating injuries caused by arrowheads are relatively rare, though one probable example has recently been identified in the British Neolithic (Smith *et al.* 2007), with another tentative case proposed below. The diagnosis of healed injuries is usually reasonably straightforward, though there is a grey area in terms of smaller depressions. Linear cranial fractures, whether healed or unhealed, are usually interpreted as resulting from accidental falls, with a broad impact surface and relatively low velocities, whereas the

concentrated force required to cause a depressed fracture is more typically seen as resulting from an intentional blow with an instrument (Lovell 1997; Given and Williams 2002).

Forensic criteria are available for the identification of peri-mortem trauma (e.g. Berryman and Haun 1996; Galloway 1999; Given and Williams 2002), including: smooth fracture margins; concentric, radiating, or 'stellate' fracture lines; depressed but still adhering bone fragments; oblique rather than transverse fracture margins; and presence of a patinated internal bevel. An invariant and absolute requirement for archaeological material is that fracture edges are fully patinated (though subsequent unpatinated breakage may be evident along part of the fracture—an example of this is seen below). However, not all these criteria for peri-mortem cranial trauma are necessarily present or identifiable, particularly on archaeological specimens, which are often fragmentary and incomplete. Therefore, it has been suggested that injuries be divided into high, medium, and low probability categories; the latter may be noted but are excluded from further consideration (Schulting and Wysocki 2005). Briefly, most or all of the above criteria are present in the high probability category. The medium probability category may lack concentric or radiating fracture lines, and/or the affected area may be incomplete, but what is present should be reasonably convincing. Fractures in the low probability category may be suggestive, but lack sufficient diagnostic criteria to warrant inclusion, whether due to incompleteness, post-mortem damage, or reconstruction obscuring key features. Also included in this category are fractures that fail individually to fully meet the above criteria (e.g. fracture margins are irregular, more transverse than oblique, etc.). They may be the result of post-mortem damage in the period within which the bone retains some of the characteristics of fresh bone; these present the most difficult cases.

SEEKING DIVERSITY

Regionality

Previous research on British Neolithic skeletal collections has identified some 40 separate cranial injuries on 32 individuals from a total of

350 'composite' crania (i.e. two halves making a whole; this was deemed necessary because of the highly fragmentary and incomplete nature of much of the material—thus the actual number of individuals represented was considerably higher). This provided estimates of approximately 2.9% unhealed injuries and approximately 6.0% healed injuries, which were then reduced slightly and admittedly arbitrarily to take into account the possibility of misidentifications and/or accidental injuries, resulting in final conservative figures of 2.5% and 5.0%, respectively (Schulting and Wysocki 2005). The majority of the material examined derived from the long barrows and chambered tombs of southern Britain. This presents a number of problems in terms of a fuller understanding of the possible nature and contexts of interpersonal violence in the Neolithic. The dominance of material from southern Britain precludes an investigation of regional variation (cf. Barclay 2000). While the earliest Neolithic is rather homogeneous in some respects across Britain (e.g. in the prevalence of Carinated Bowl pottery (Herne 1988; Sheridan 2007), and in evidence for an economy based on mixed farming (Schulting 2008)), there is also considerable evidence for variability in others (e.g. in the presence and form of monuments, with different forms showing more or less distinct regional distributions). In addition, while they do occur elsewhere, causewayed enclosures remain most common in southern England (Oswald *et al.* 2001). Differing scales of monumental construction could suggest different scales of socio-political integration (cf. Harding 1995), which might be expected to have an impact on the prevalence of, and contexts for, violence. For example, larger socio-political units would have the potential to field larger forces and to engage in more sustained campaigns. Increasing regionalization is also seen in pottery as the Neolithic progresses through the fourth millennium BC.

Unfortunately, it is not yet possible to provide an adequate account of regional variability in the evidence for interpersonal violence across earlier Neolithic Britain. The clearest potential for such a comparison is between southern and northern Britain. In practice, this becomes predominantly a comparison of southern England and Wales with Orkney. Neolithic material survives in northern England, particularly Yorkshire, but overall numbers are relatively low. Even less material is available from North Wales and Scotland outside of Orkney (although not considered here, the same applies to Ireland). Some of this material is still in the process of being examined, both by

the author and by other researchers, but while it is not possible to make formal comparisons of the prevalence of injuries at this stage, some preliminary comments can be offered.

Assemblages from three earlier Neolithic Yorkshire long barrows were examined as part of a larger study of British Neolithic crania (Schulting and Wysocki 2005) (Figure 13.1). In an extension of this research, the material was recently re-examined and the completeness and state of preservation of individual crania scored in more detail.



Figure 13.1. Map showing locations mentioned in the text.

Based on the presence of frontal bones, a minimum number of 24 adult/adolescent crania or partial crania were identified from Dinnington (18), Ebberston (four), and Rudston (two). Of these, five show reasonably convincing evidence (i.e. medium or high probability categories) ante- or peri-mortem trauma. An adult female presents a small, healed depressed fracture, which is the most typical injury for the period (Figure 13.2), while an adult male exhibits a linear fracture in the early stages of healing (Figure 13.3). This newly observed injury is of a type less frequently seen in Neolithic Britain (in fact, this is the only example known to the author), and may be the result of an accident (e.g. a fall) rather than conflict, as discussed above. This interpretation is consistent with the absence of any discernable point of impact. Three crania (two male and one female) present probable peri-mortem injuries (Table 13.1; Figures 13.4 and 13.5). All five injuries are to the left side of the cranium; however, in one case this is better seen as a blow to the rear of the head, which presents a different scenario than the face-to-face encounter often assumed for injuries to the left front and side of the head.

In terms of the percentage of individuals affected, then, one could propose figures of 4.2% (one of 24) healed injuries (discounting the linear fracture as accidental), and 12.5% (three of 24) peri-mortem injuries. However, this fails to take into account the incomplete condition of many of the crania. As all the injuries affect the four principal bones of the adult cranium—the frontal, two parietals, and

Table 13.1. Details of medium and high probability cranial injuries from two Yorkshire long barrows

Site	Cat. no.	Age	Sex	Location	State	Dimension (mm)	Comments
Dinnington	Sk 1807	Adult	M	L parietal/ occipital	peri-	23.2 × 13.3	Depressed adhering bone; patinated internal bevel
Dinnington	Sk 1811	Adol.	F	L frontal	peri-	21.9 × 12.2	As above
Dinnington	Sk 1817	Adult	F	L parietal	ante-	11.5 × 7.5	1.9 deep, no internal impact
Dinnington	Sk 1820	Adult	M	L frontal	ante-	74.3	Healing linear fracture
Ebberston	Sk 1795	Adult	M	L parietal	peri-	14.5 × 5.5	Damaged fracture margins; patinated internal bevel

F, female; L, left; M, male.



Figure 13.2. Adult female cranium from Dinnington showing small healed depressed fracture (Sk 1817, Natural History Museum, London).

occipital—one recourse in this case would be to use the figure of approximately 85% completeness for these elements from Figure 13.6 as a correction factor, resulting in a notional figure of some 20 (i.e. 0.85×24) ‘complete’ crania (cf. Robb 1997). This in turn suggests slightly higher prevalences of 5% (i.e. one of 20) healed and 15% (three of 20) unhealed cranial injuries for this group. (Incidentally, it is also apparent from Figure 13.6 that the faciomaxillary region is less well represented in this collection, and consequently has a much reduced chance of recording injuries, for example nasal fractures.) The unhealed injury prevalence for northern England is thus considerably higher than the overall British Neolithic figure of 2.9% (which includes the Yorkshire material; excluding it results in an estimate of 2.1% unhealed trauma). While the sample size for Yorkshire is small, the difference is statistically significant (Fisher’s exact test, $P = 0.025$), though too much should probably not be read into it at this stage. However, it does, highlight the potential to investigate regional differences in the prevalence of interpersonal violence. The limited additional material available from northeast England is being examined, and will provide a firmer basis for a regional comparison with

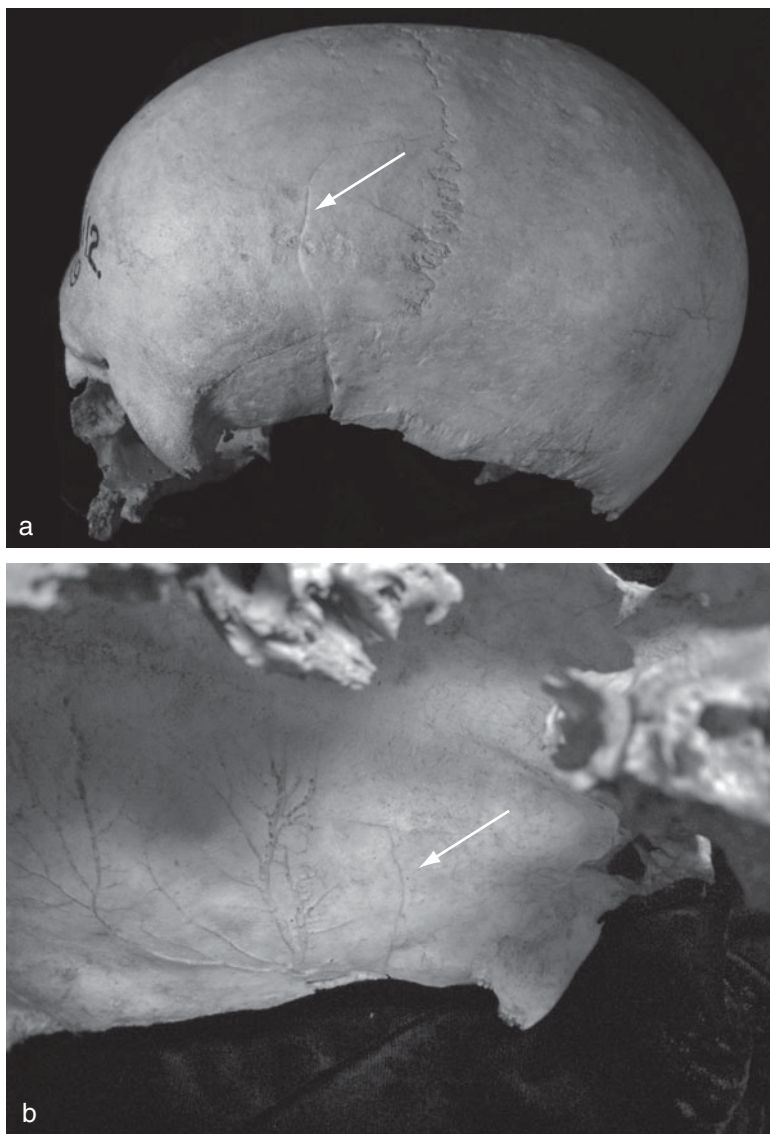


Figure 13.3. Adult male cranium from Dinnington showing healed linear fracture on (a) external and (b) internal vault (Sk 1820, Natural History Museum, London).

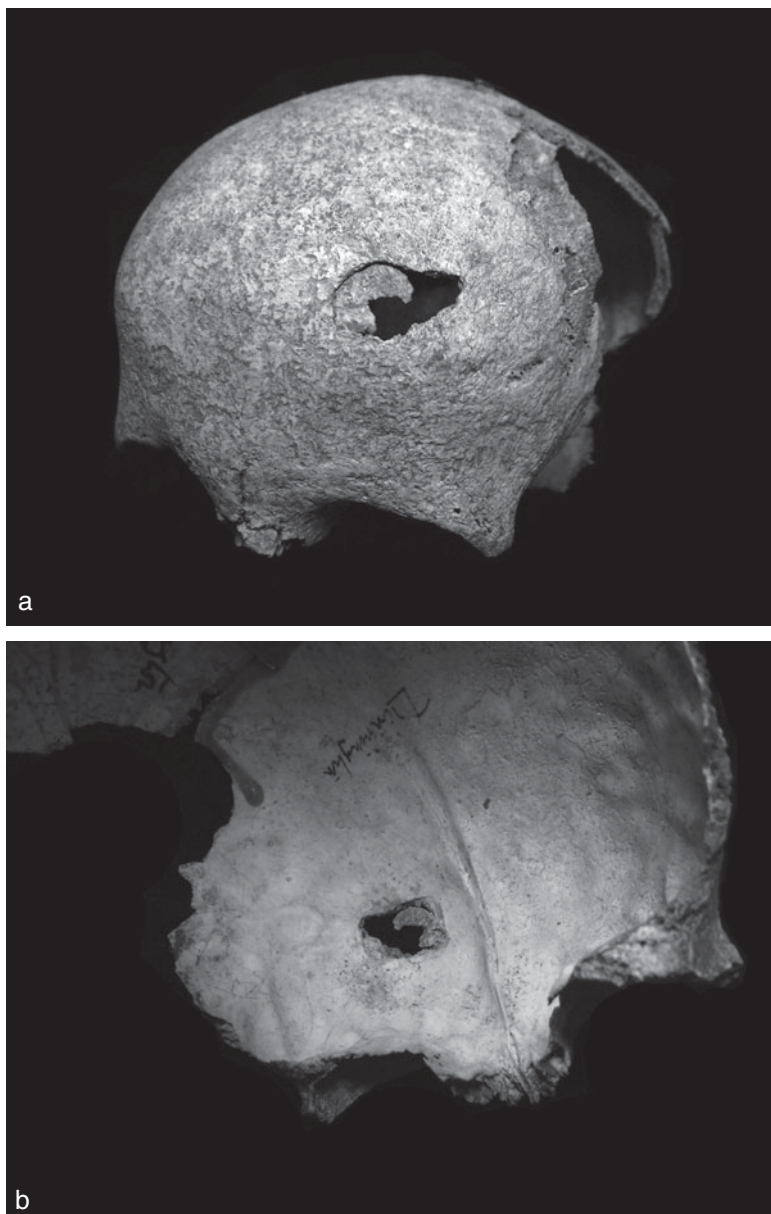


Figure 13.4. Adult male cranium from Dinnington showing probable perimortem fracture (a) external and (b) internal vault (Sk 1811, Natural History Museum, London).

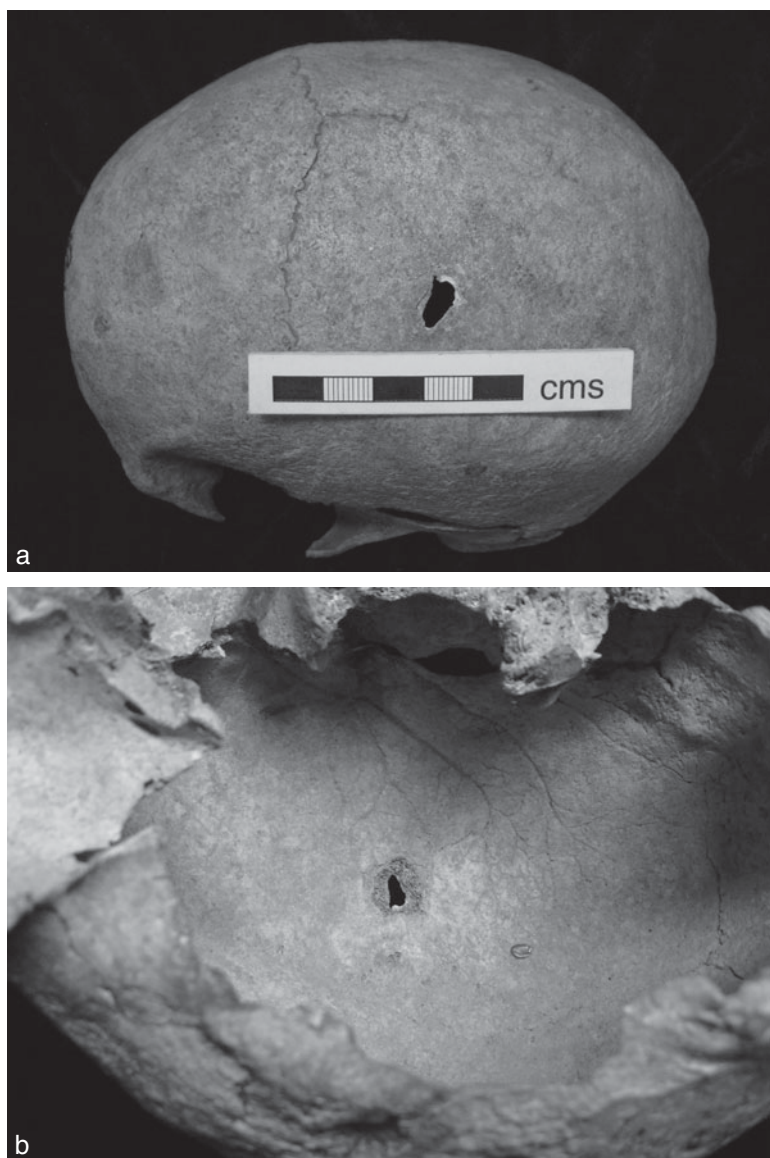


Figure 13.5. Adult male cranium from Ebberston showing probable peri-mortem fracture to a. external and b. internal vault; post-mortem damage is visible on the fracture margins but there is otherwise good patination (Sk 1795, Natural History Museum, London).

the south. The comparison is a particularly interesting one, as northern England seems to show a different trajectory from that seen in the south; for example, it lacks the causewayed enclosures that seem to reflect a higher level of socio-political integration (Harding 1997). As noted above, this difference might be expected to affect the scale and nature of interpersonal violence.

One of the more intriguing sites in Yorkshire, not included in the above comparison because of its probable later date, is Duggleby Howe, one of a small number of very large round barrows with origins in the later part of the earlier Neolithic (3500–3100 cal BC). The central shaft under the mound held the remains of five adults and a child of approximately 5 years old, overlain by a number of mainly infant and child burials, in turn surmounted by a large number of cremations (Mortimer 1905). Cranium J, a young adult of uncertain sex, exhibits peri-mortem circular perforations to the left and right parietals, the result of very strong blows with a club-like instrument

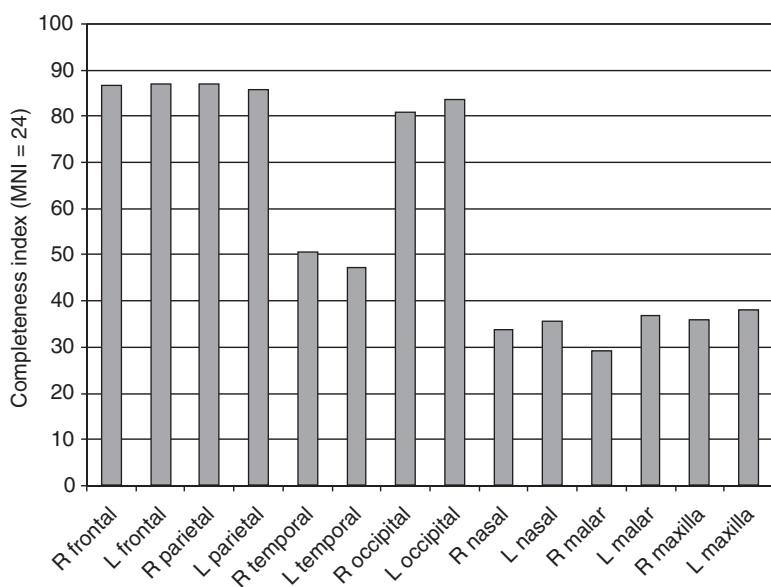


Figure 13.6. Completeness index graph (estimated in 10% increments for each element; e.g. a right frontal might be scored as 50% complete) for adult/adolescent human crania from Yorkshire long barrows (Ebberston, Dinnington and Rudston, MNI = 24, based on frontals).

(Figure 13.7). The specimen was first described by Garson in 1905 in terms that are easily recognizable today:

On each parietal of J, just above the parietal boss, a rounded opening occurs, that on the left side being 33 mm., and that on the right 20 mm. in diameter, the edges are bevelled inwards, and from them stellated fracture rays extend. There is little doubt that these holes are the result of sharp and quick blows delivered with considerable force, and would have been sufficient to cause the death of the person

Garson (1905, p.34)

This early diagnosis has been recently independently confirmed by Gibson and Ogden (2008) and by the present author. Cranium J was found lying at the feet of burial I, an older adult male. A sacrificial context has been proposed to account for the placement of J and its injuries, and this does seem a reasonable suggestion (Kinnes *et al.* 1983; Loveday 2002). However, cranium J was reportedly present only as a cranium (i.e. lacking its mandible), which calls this interpretation into question, although the possibility remains that it represents a curated trophy. None of the nine other individuals (seven adults and two children) examined from the site exhibit convincing injuries, although Gibson and Ogden (2008) comment on a possible unhealed fracture to the left parietal of skull I, the diagnosis of which is uncertain as a result of unsympathetic early restoration efforts. This is a not uncommon problem when dealing with these older collections (Schulting and Wysocki 2005).

Moving further north, very few human remains are available for Scotland outside of Orkney, though two important exceptions are the chambered tombs of Clachaig and Torlin on the west coast island of Arran, with 14 and six individuals represented, respectively (Bryce 1902). Aside from small fragments, only seven adult crania are extant, none of which showed any evidence of injury on examination by the author. The only Neolithic sites on the Scottish mainland with more than a few fragments of surviving unburnt human bone are the Embo chambered tomb in Sutherland (Henshall and Wallace 1965) and three chambered tombs in Caithness—Tulloch of Assery A, B, and Tulach an t-Sionnaich—and even here preservation was poor, and the material highly fragmented (Corcoran 1967). An adolescent at Tulloch of Assery A is reported as having a possible peri-mortem cranial fracture, but the present author's re-examination of the material suggests only post-mortem breakage. Not open to question is the

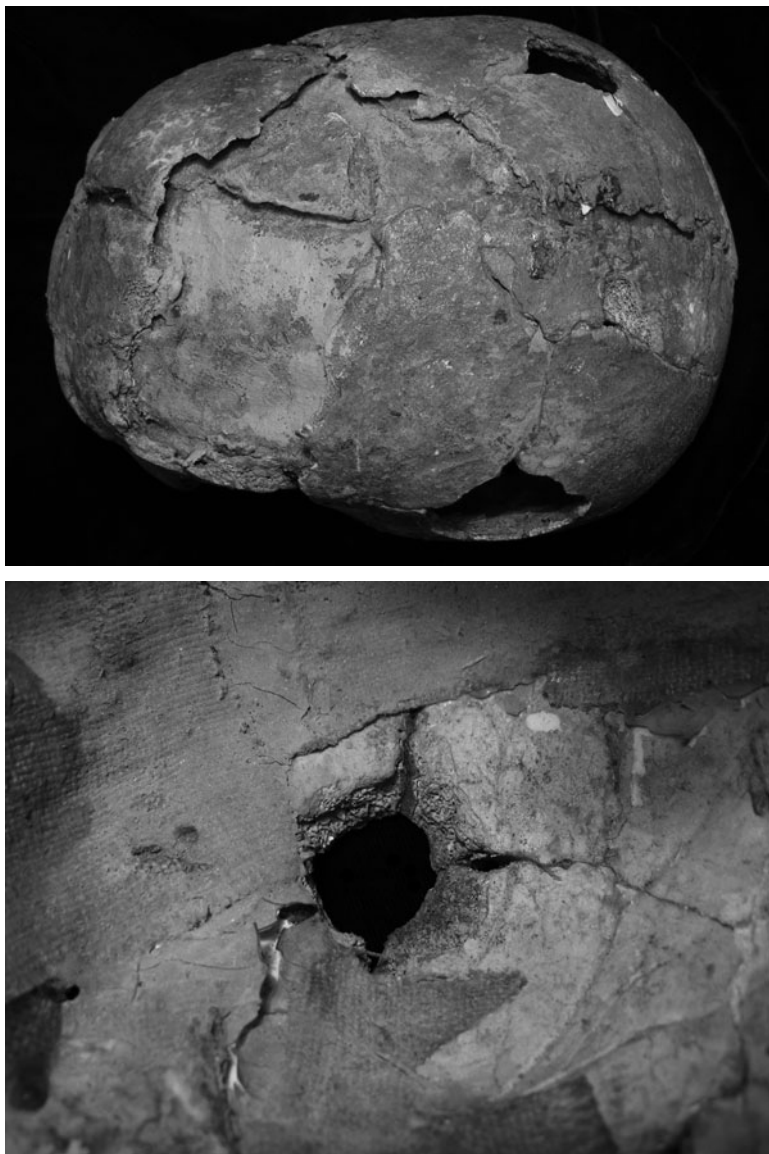


Figure 13.7. Adult male? cranium 'J' from Duggleby Howe, Yorkshire, showing peri-mortem injuries to left and right parietals a. external and b. internal views (Hull and East Riding Museum).

tip of a flint arrowhead embedded in the vertebra of an adult male at Tulloch of Assery B (Figure 13.8). This entered the body from behind, with the angle suggesting that it was near the tail end of its trajectory, and hence was shot from some distance (Young, in Corcoran 1967).

Relatively large assemblages of human remains are available from Orkney, because of its less acidic soil conditions, but also because of the high density of Neolithic settlement in the archipelago. Unfortunately, many sites were excavated in the nineteenth and early twentieth centuries, and much material has been lost. Nevertheless, approximately 200–250 individuals are still represented in museum collections, albeit many only partially. This material is still in the process of being re-examined, but it is clear, contrary to the impression of an absence of trauma reported by Chesterman (1983), that there is indeed evidence for cranial injuries attributable to violent interactions, seen at the sites of Isbister, Rowiegar, and Unstan (Lawrence 2006; Smith and Brickley 2009; Schulting pers. obs. 2009). A depression on the left frontal of an adult, probably female,

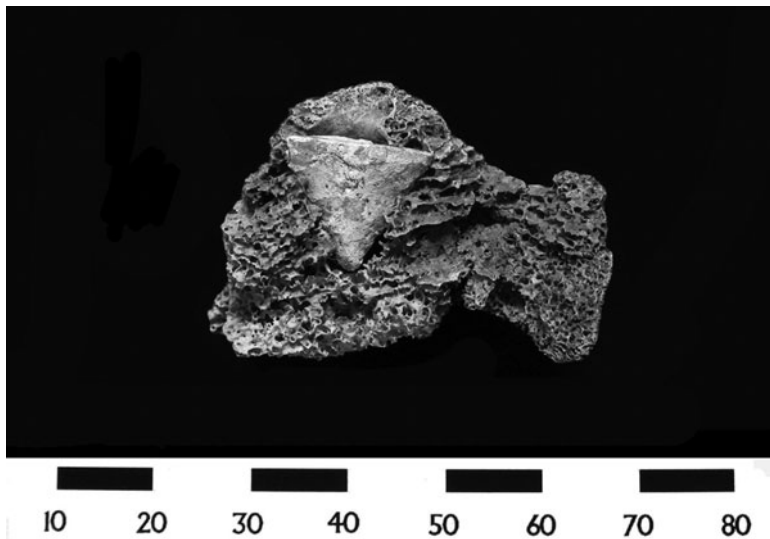


Figure 13.8. Tip of flint arrowhead embedded in vertebra of adult male? from Tulloch of Assery B, Caithness, Scotland (photo reproduced by permission of the Trustees of National Museums Scotland).



Figure 13.9. Adult female cranium from Isbister showing one of two healed depressed fractures (DL46, The Orkney Museum).

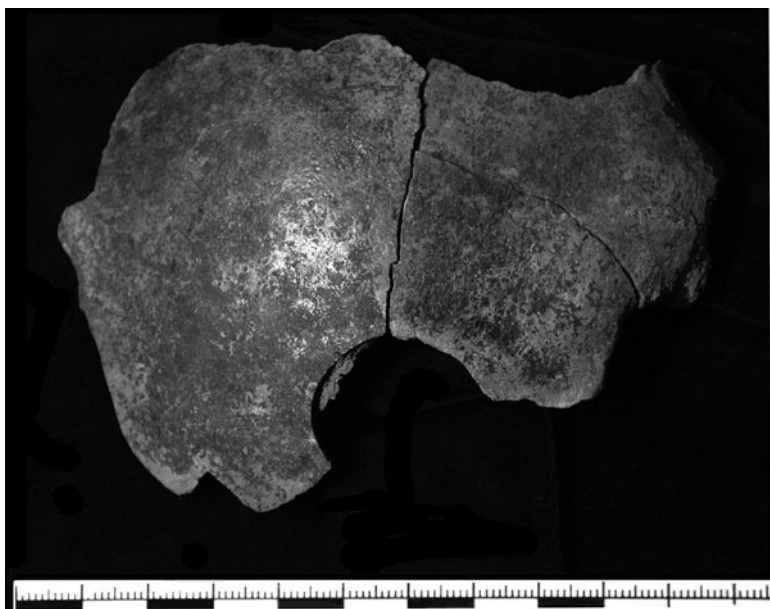


Figure 13.10. Adult frontal fragment from Unstan with peri-mortem injury (National Museums Scotland).

from Isbister has a distinctive lenticular shape (Figure 13.9); a large, well-healed round depression is found on the mid-right occipital of the same individual. Although incomplete, an adult frontal from Unstan shows a reasonable candidate (medium probability) for a peri-mortem injury, with a smooth, rounded fracture arc and a patinated internal bevel (Figure 13.10). This material will in due course provide the basis for a more robust comparison with southern Britain.

Monumental versus non-monumental burial contexts

The dominance of formal mortuary contexts, regardless of their regional diversity, presents another inherent bias. It has long been recognized that, with some notable exceptions, human remains from long barrows and chambered tombs do not represent anything like the total population of Neolithic Britain, even over the few centuries of their main period of use (Atkinson 1968). What is not clear is the basis for inclusion (Schulting 2007). In relation to the present theme, was an individual dying a violent death more, or less, likely to be placed within a mortuary monument? Certainly, such a death was not a criterion for exclusion, as most of the available evidence for peri-mortem cranial injuries derives from long barrows and chambered tombs (not surprisingly as this constitutes most of the available material). At least two individuals at the Belas Knap chambered tomb, for example, show unhealed cranial trauma. Neither fits the expectation of an adult male 'warrior': one is an older child, about age 6–10 (Figure 13.11) and the other an adult, probably female. Individuals exhibiting embedded, complete or fragmented, projectile points are also known from mortuary monuments, namely Tulloch of Assery B, mentioned above, as well as Ascott-under-Wychwood, Penywyrldod, and, most recently, Wayland's Smithy (Wysocki and Whittle 2000; Knüsel in Benson and Whittle 2007; Whittle *et al.* 2007). Sex can be determined in only two of these cases, both male. Incidentally, the only example of an embedded projectile point from Neolithic Ireland, from the site of Poulmabrone, is also found on a male (Lynch and Ó Donnabháin 1994). This seems to conform to a widespread trend in Neolithic Europe, in which males are predominantly affected by projectile injuries, while cranial injuries are more variable from region to region (Guilane and Zammit 2001; Schulting 2006; Vegas 2007; Vegas *et al.*, this volume, Chapter 15).



Figure 13.11. Subadult cranium from Belas Knap with peri-mortem injury to a. external and b. internal vault (Eu.1.5.9, Duckworth Collection, Cambridge).

The same considerations would not apply to those individuals exhibiting well-healed injuries, and their history of violent encounters may have been of less relevance in terms of their final funerary treatment. On the other hand, it would not be difficult to envisage scenarios in which this was indeed a relevant consideration. One suggestion often made concerning healed injuries is that they might reflect bouts of ritualized conflict, in which the death of one's opponent was not necessarily sought (e.g. Walker 1989; Standen and Arriaza 2000). Individuals participating in such contests—perhaps on behalf of their lineage or community—might be expected to have an elevated standing in their community, which in turn might make them more likely to be given a privileged funeral (if that is how burial in a chambered tomb is to be interpreted, which does seem a reasonable hypothesis). By contrast, some individuals exhibiting healed injuries might have very different histories of violence, for example, of belligerence within the community, which would not be valued positively. Gender might also be expected to play a role in differing perceptions and valuations of violence, although it is one that at present remains difficult to address in a satisfactory way. Thus far, it appears that approximately equal numbers of men and woman were affected by both healed and unhealed cranial trauma in Neolithic Britain (Schulting and Wysocki 2005). Domestic violence may be a factor in some of these injuries, and this again might be thought to be less immediately relevant with regards to burial treatment, at least in the case of well-healed injuries.

The question then arises whether those buried in long barrows and chambered tombs are representative of the earlier Neolithic population at large, concerning the prevalence of healed and unhealed injuries. The obvious means of investigating this issue is through a comparison with human remains from other contexts. However, this is far from straightforward. Causewayed enclosures are one candidate, but, with the notable exception of Hambledon Hill, overall numbers of human remains are low at these sites. Examination of collections from causewayed enclosures is still ongoing, but some preliminary observations can be offered. Hambledon Hill provides a starting point. McKinley's (2008) recent re-examination of the human skeletal material found two depressed fractures in a total of 15 (13.3%) reasonably complete crania (though a minimum of nearly 80 individuals is represented by postcranial remains), one on an unsexed subadult or young adult, and the other on an adult

male. One of only two adult human crania recovered from the causewayed enclosure at Staines was previously discussed in relation to purported healed and unhealed injuries (Schulting and Wysocki 2005). However, the cranium in question was heavily plastered and a text description provided the only evidence (Camps *et al.* 1987). A photograph of this specimen before reconstruction has since been located, and does not appear to show convincing evidence of injuries (Figure 13.12). What does remain intriguing is the cranium's association with its mandible and two uppermost cervical vertebrae, indicating it was deposited in the ditch section as a fleshed head. This also applies to three skulls at Hambledon Hill (McKinley 2008). The deposition of fleshed heads appears to be associated more often with causewayed enclosures than with other mortuary contexts, although their identification in the jumbled communal remains typifying long barrows and chambered tombs would be difficult.

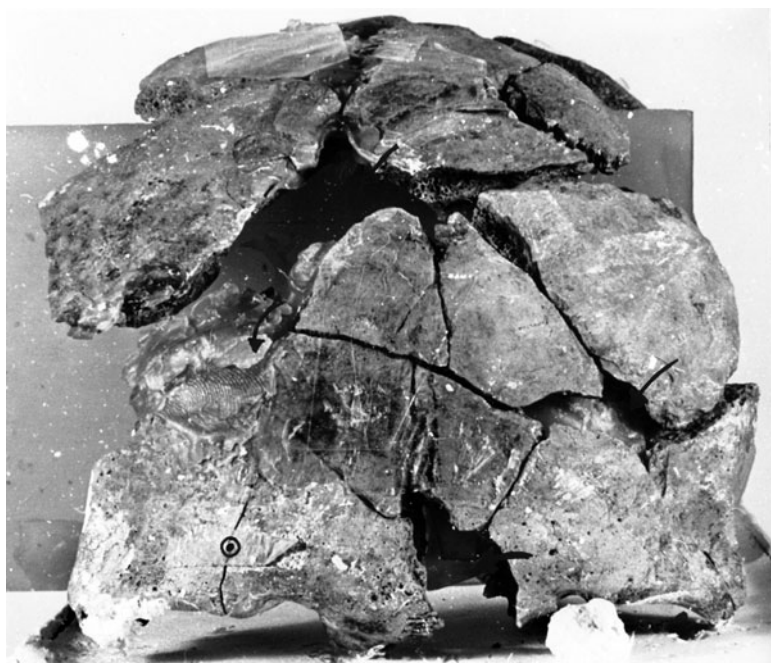


Figure 13.12. Adult male cranium from Staines, before reconstruction (photo reproduced by permission of English Heritage Sites and Monuments Records, Swindon).

'Decapitations' have been noted in the literature at Wor barrow (Pitt-Rivers 1898), and at Whitegrounds (Brewster 1984), but in neither case is evidence for cut marks reported (and in the case of Wor barrow a cleanly cleft vertebra suggests the use of a metal implement (Smith and Brickley 2009, p.144)). Interpretation of these finds is unclear, but they do at least raise the possibility of a context of violence rather than ancestor rites, as is so often assumed (cf. Whitley 2002).

Both complete skeletons and disarticulated remains, especially crania, were found during early excavations at the Whitehawk causewayed enclosure (Curwen 1934). A recent dating program has confirmed their earlier Neolithic age (Healy *et al.* 2011). This is an interesting assemblage, in that all five—two of which are children—of the reasonably complete crania (three other children, all in the range 7–12 years, are represented by a few cranial fragments) from the site exhibit fractures suggestive of peri-mortem breakage, though none is in the high probability category. A common problem arises here, in that bone will remain in a 'fresh' state for some months after death, and fractures caused within this period will demonstrate to varying degrees the characteristics of injuries suffered at or near the time of death (Berryman and Haun 1996). It is possible, then, that the observed fractures refer to post-mortem practices (though what these would be is difficult to envisage, but see Orschiedt and Haidle, this volume, Chapter 7), or to post-depositional damage. One of the better examples, placed in the medium probability category, is that of an adult female with indications of a blow to the right frontal (Figure 13.13). The area is incomplete (hence medium probability), but there are radiating fractures and a patinated internal bevel. Interestingly, the same individual also exhibits a flattened D-shaped perforation to the mid-occipital region (with patinated margins and adhering bone pushed into the interior but lacking a good bevel) that presents a reasonable candidate for an arrow injury (Figure 13.14). If so, the patinated exterior bevel might be the result of forcibly extracting the arrow. Higher magnification examination of the fracture margins might be useful in confirming or discounting this putative injury (cf. Smith *et al.* 2007).

In the absence of much evidence for flat cemeteries in the British Neolithic, two non-monumental contexts offer potential for a comparison with human remains from the monuments of the period: rivers and caves (Schulting 2007). Both could potentially represent a

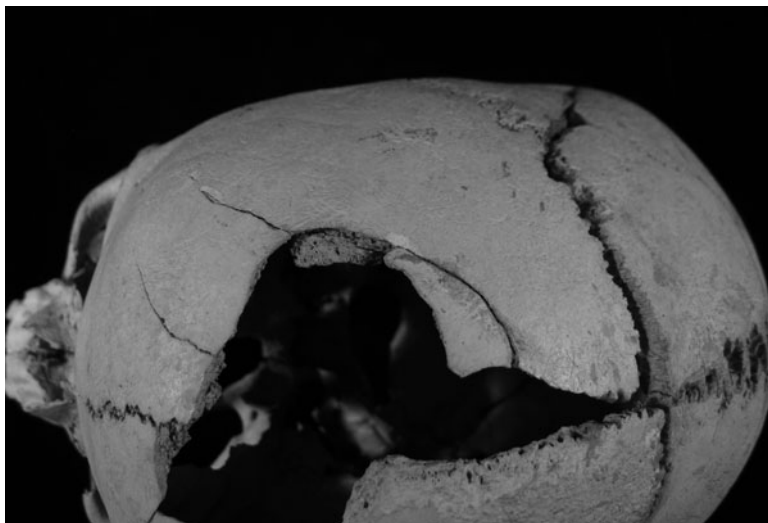


Figure 13.13. Adult female cranium from Whitehawk with possible perimortem injury to right frontal (Skeleton IIa, Royal Pavilion and Museums, Brighton and Hove).

different segment of the Neolithic population than found in monuments; both, however, suffer from uncertainties regarding dating. In the case of the so-called 'river skulls' (Bradley and Gordon 1988; Turner *et al.* 2002), each individual specimen must be dated before it can be attributed to a period, and to date only specimens showing injuries would clearly bias the sample. There is also the question of how human remains, and crania in particular, entered the river; this may be the result of the intentional deposition of complete bodies or fleshed/unfleshed heads, drownings, or riverside erosion of terrestrial graves (Knüsel and Carr 1995). The Thames is the source of the greatest number of 'river skulls', with some 300 examples still extant (and many more since lost); these were found during dredging and construction works, primarily in the nineteenth century (Bradley and Gordon 1988). The great majority remain undated, but one of eight crania (none showing injuries) included in an AMS dating program yielded an earlier Neolithic result (*ibid.*). A very different situation was found with a collection of crania recovered from the River Ribble in northwest England, where five of eight directly dated specimens could be attributed broadly to the Neolithic (Turner *et al.* 2002). One

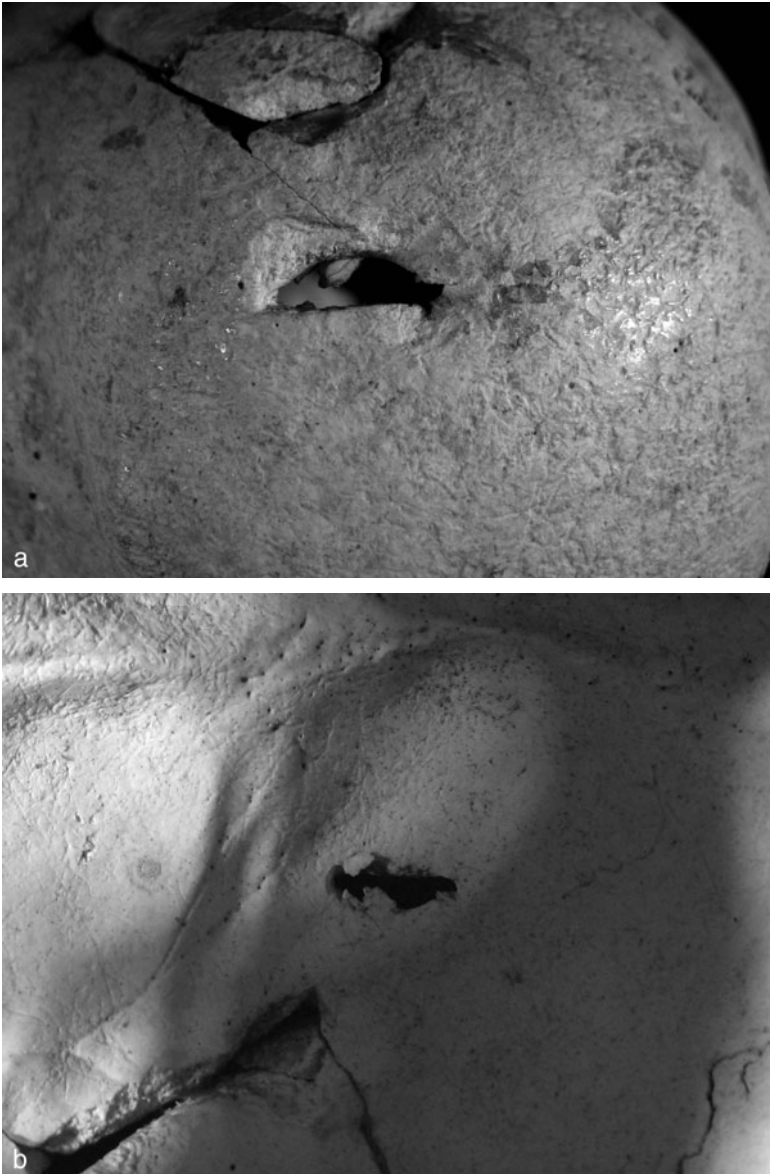


Figure 13.14. Adult female cranium from Whitehawk with possible arrow injury to mid-left occipital; a. external and b. internal views (Skeleton IIa, Royal Pavilion and Museums, Brighton and Hove).

of these showed a possible unhealed injury to the occipital, though the high-energy nature of the river in flood suggests the need for a more cautious interpretation, as this may be a post-depositional feature, occurring while bone was still in a relatively fresh state (Schulting and Wysocki 2005, p.116). Some 12 individuals are represented in a palaeochannel of the River Trent, possibly associated with a log jam dated by dendrochronology to the Late Neolithic. One individual has been directly AMS dated, leading to the suggestion that the whole group could belong to this period (Garton *et al.* 1997). No injuries have been reported, but the assemblage has not been re-examined with this goal in mind.

Caves are less problematic, but are generally disturbed and show evidence for multiperiod activity, again making the direct AMS ^{14}C dating of a substantial proportion of individuals represented essential. There are at least fewer concerns over how human remains were deposited. In some cases caves and built monuments occur near one another (from within tens of metres to a few kilometres), and show chronological overlap in their use (Schulting 2007). Increasing numbers of radiocarbon dates are becoming available on human remains from caves (Chamberlain 1996; Schulting 2007; Leach 2008), but with a few exceptions, there are still generally only a few determinations for any given site. Extrapolating from one or a few dates to all individuals represented is rarely justified in these contexts, which are often disturbed and multiperiod. Thus, while there is potentially a reasonably large amount of Neolithic skeletal material from caves its use currently remains limited by uncertainties over dating. Nor has much of this material—with its varied collection history, often involving local societies, cavers, and amateur archaeologists—yet been systematically re-examined. The site of Rhos Ddigre in North Wales illustrates the need for direct dating. In an early investigation of this cave, Boyd Dawkins (1874) reported two ‘seated burials’ associated with Neolithic pottery and stone axes. Only the crania survive today, with one being described as having been ‘broken before burial’, which is exactly what is written on the left parietal (Figure 13.15; see front cover). The diagnosis is in fact a reasonable one, with a recent re-examination confirming that the fracture displays many of the features of a peri-mortem injury. The other cranium exhibits no evidence of injury, though their apparent association with one another and with Neolithic artefacts might suggest similar circumstances of death. However, while AMS ^{14}C dating confirmed an early



Figure 13.15. Adult cranium from Rhos Ddigre, North Wales, with peri-mortem injury to the right parietal; a. external and b. internal views (National Museum of Wales).

Late Neolithic (OxA-17562, 4354 ± 27 BP: 3080–2904 cal BC) attribution for the injured cranium, the other proved to date to the Middle Bronze Age (OxA-17563, 3141 ± 26 BP: 1494–1322 cal BC). (Dates were calibrated in OxCal 4.1, using IntCal 2009.) Their association in the cave is therefore fortuitous, and calls for an entirely different explanation than if they were contemporary.

It is not yet possible to compare caves and monuments systematically. There are other examples of cranial injuries from caves in both southern and northern Britain, but these are yet to be directly dated. One case in point derives from Lesser Kelcoe Cave, Yorkshire, with a small, healed, depressed fracture to the top of a probable adult cranium (Leach 2008). Although another individual from the same cave has been directly dated to the earlier Neolithic, the injured cranium has not been dated. Although dating to the Early Bronze Age (2210–2030 cal BC), another Yorkshire cave, Feizor Nick, is worth mentioning as presenting one of the relatively rare cases of a projectile point injury to a female (Smith *et al.* 2007).

CONCLUSIONS

The purpose of this chapter has been to highlight potential avenues of research that can begin to address in more detail variation in the prevalence of cranial trauma in the earlier Neolithic of Britain, and, in so doing, to improve our understanding of the contexts in which it occurred. There are tentative preliminary indications that real differences in the prevalence of injuries may be found between assemblages from monuments in different regions of the country. Assemblages from chambered tombs/long barrows and causewayed enclosures provide another potentially interesting line of inquiry, though the numbers of remains available from the latter are limited. Perhaps more promising is a comparison of individuals found in mortuary monuments with those from other, non-monumental, contexts. Caves seem to offer the greatest potential in this regard, with significant numbers of human remains; however, uncertainties over dating mean that this comparison will be difficult to realize until more systematic dating programs are applied. Efforts in this direction are underway.

ACKNOWLEDGEMENTS

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Evidence of trauma in Neolithic Greece

Anastasia Papathanasiou

ABSTRACT

In the course of osteological analysis of Greek Neolithic skeletal assemblages, a number of cases of trauma have been identified by various researchers. This work reviews all recorded evidence of trauma during the Mesolithic and Neolithic Periods in Greece due to either accidental causes or violence. In Alepotrypa Cave, there is a prevalence of 13% (nine of 69 individuals) with healed cranial depressed fractures observed mainly on adult males as well as females and subadults, which has been interpreted as interpersonal violence due to competition for vital resources, while post-cranial injury was relatively low and accidental in character. In Franchthi Cave the overall prevalence, including cranial and postcranial trauma, for the overall prehistoric population is 7.9% (five of 63 individuals). Cranial trauma seems more prevalent at this site in the Mesolithic (two of 17) than in the Neolithic (none of 46). In Early Neolithic Nea Nikomedeia a higher rate of trauma has been observed, mainly on the lower skeleton, of young and prime adults, which affected more men than women. In Proskynas there is one case (of seven) of a healed depressed fracture, as well as in Early Neolithic Xirolimni (one of 10), while there are two (of 31) in Late/Final Neolithic Kephala. No evidence of traumatic lesions was observed at Neolithic Makriyalos and Theopetra Cave. Overall, the evidence does not point to generalized warfare but to sporadic non-lethal confrontations mainly between young males with blunt objects used as weapons.

INTRODUCTION

Studies on war and violence in Greek archaeology go back as early as the Bronze Age, where a long epic tradition exists in ancient Homeric literature (*Iliad* and *Odyssey*), with indirect evidence in the archaeological context (weapons and armour), as well as depictions on wall paintings, pottery, and sealstones. However, even in the Bronze Age, when warrior societies thrived, references to war and violence are idealized as noble and heroic. On the other hand, direct evidence of trauma on human skeletal remains is circumstantially referred to in a small number of anthropological studies. By contrast, the Neolithic age was always considered as a period of peaceful coexistence of agriculturalist societies. Similarly, the role of interpersonal violence in the Neolithic period was never addressed. In addition, no studies on direct evidence of trauma on human osteological material have been done in relation to the origins of war, although cases of trauma are described among other pathological conditions in a number of anthropological studies of Neolithic sites (Papathanasiou 2001, 2005; Triantaphyllou 2001). This perspective, regardless of whether it was deliberate or not, is in accordance with a general European view of prehistory, which Keeley (1996) has termed as 'pacifying the past' (Vencel 1984; Thorpe 2003; Vandkilde 2003; Schulting and Wysocki 2005). In this chapter, first the archaeological context of Neolithic Greece, where the earliest transition to the Neolithic occurred in Europe, as well as indirect evidence of interpersonal violence, are briefly summarized, to establish a working framework and characteristics of a non-state society and to determine if a background for violence exists. Bioarchaeological data from direct observation of human skeletal material from all published Greek Neolithic sites are reviewed with social inferences being drawn whenever possible.

THE APPEARANCE OF THE NEOLITHIC

After domestication and food production were adopted in Near East, they gradually spread to the adjacent areas of Europe. The Greek

Neolithic begins about 6700 BC and lasts up to 3200 BC, and is subdivided into Early (6800–5800 BC), Middle (5800–5300 BC), Late (5300–4500 BC), and Final (4500–3200 BC). Early Neolithic sites in Greece and the Balkans show distinct similarities to their Near Eastern precursors, in their suite of domesticates, settlement patterns, and material culture, but from the very beginning they indicate their own character and a successful adaptation to a new environment outside the core area of domestication in the Levant. There is a prevailing theory that it represents the adoption of a farming economy by indigenous people, and the gradual intermixing of foraging with an agriculturalist culture (Renfrew 1987; Coleman 1992; Andreou *et al.* 1996; Bogucki 1996; Whittle 1996).

In the Early and Middle periods, most sites were concentrated in the lowlands of central Greece, usually in riverine or coastal areas with access to different types of resources (van Andel and Runnels 1995). The typical occupation is comprised of small compact villages with repeated rebuilding of houses, which resulted in the characteristic tells evident in the Middle Neolithic. During the Late Neolithic increased sedentism is observed, judging from the permanent tell-like sites stressing continuation. Habitation in caves increased, and other areas of Greece were inhabited, indicating population growth. Some sites were abandoned and the population seemed to concentrate into fewer, larger settlements. By the Final Neolithic more land was utilized, the number of small sites increased, as well as cave occupation, and populations became more nucleated around large centres and extended into more marginal agricultural areas (Tsountas 1908; Theocharis 1973; Hourmouziadis 1979; Coleman 1992; Kotsakis 1994; Alram-Stern 1996; Andreou *et al.* 1996; Papathanassopoulos 1996; Whittle 1996).

Architecture and use of space does not point to any social differentiation in the Early and Middle Neolithic, with the possible exception of the Middle Neolithic site of Sesklo, where architectural differences and restricted access are correlated with different quality goods (Kotsakis 1983, 1986). In the Late Neolithic, architectural variations, possibly implying social inequality and indicating hierarchical stratification of the society, as well as the establishment of large central buildings, are clearly seen in the multiple concentric walls of Dimini and the ditch-enclosed platform of Agia Sophia (Andreou *et al.* 1996).

EVIDENCE FOR VIOLENCE

Regarding violence, there is little unambiguous evidence based on the archaeological record. There are no depictions of weapons or armaments but there are stone and bone spearheads and arrowheads, which could be used as tools, weapons, or both. In addition, on the issue of fortifications, a number of sites have been built on summits and promontories or are encircled by walls, trenches, or ditches. The Sesklo site (ca. 5900 BC) is encircled by a retaining wall along the edges of a rather steep slope (Kotsakis 1983, 1986); the Dimini site (ca. 5500 BC) consists of several concentric retaining walls between which are buildings and working areas (Andreou *et al.* 1996); while the Makriyalos site is flanked by a long ditch (Triantaphyllou 2001). Those constructions, as well as others from material that did not survive to be included in the archaeological record, could be fortifications, a term taken at face value; however, they could also be symbolic or functional and protective. In the absence of more solid evidence, the first farming communities were considered very egalitarian and peaceful. According to Marija Gimbutas, in the Goddess-based civilizations of this age, the sites of towns were not chosen for their ability to be defended (such as hilltops) but were chosen for their idyllic beauty reminiscent of the Garden of Eden stories in many myths (Gimbutas 1991).

Turning to the bioarchaeological data derived from lesions on skeletal material, which can provide more direct and unambiguous evidence of violence, a different picture emerges. Before presenting results from the analysis of material from Neolithic Greek sites, one should comment on the state of preservation. Soil conditions and burial practices, including primary inhumation, cremation, and secondary interment as well as selective reburial of skeletal elements, and scattered bone, in conjunction with very old excavations and inadequate curation have resulted in great variability in terms of preservation and often in a poorly preserved, commingled, and fragmentary series, hampering statistical analysis. The prevalence will be calculated as the observed trauma over the observable elements; however, due to the fragmentary nature of the material, in certain cases, an element is only represented by a fragment.

As it is difficult to distinguish between fractures caused by accidents or interpersonal violence, the focus will be on cranial traumatic

lesions, either ante-mortem or peri-mortem, which could be interpreted accurately as bearing evidence of violent interactions (Larsen 1997; Lovell 1997; Walker 2001; Schulting and Wysocki 2005). 'Broken bones are the tip of the iceberg' (Steckel and Wallis 2007), as most wounds affect only soft tissues without leaving evidence on bones. Only one injury in seven can be classified as musculoskeletal (Rand 1997). Furthermore, while deliberate aggression can affect any part of the body, the head is the most common target of interpersonal violence (Steckel and Wallis 2007). Thus, the focus of this work is on cranial trauma only. Postcranial trauma will be presented as well but will not be counted as evidence of violence. Furthermore, an attempt will be made to distinguish between individual acts of interpersonal violence and warfare or endemic violence. In generalized warfare, we expect higher levels and greater physical evidence of violence, different tools/weapons, presence of healed and unhealed injuries, with all members of the community being affected regardless of sex and age (Thorpe 2003; Vandkilde 2003; Schulting and Wysocki 2005).

To identify violence in Neolithic Greece, all sites that have yielded and published skeletal material have been reviewed (see Figure 14.1). They encompass all periods of the Neolithic plus the two Mesolithic sites that have published osteological material. The sites include Franchthi (Angel 1969, 1973a; Papathanasiou forthcoming), Theopetra (Stravopodi 1995), Pontokomi, Xirolimni, and Mavropigi (Papathanasiou 2008), Nea Nikomedeia (Angel 1973b; Triantaphyllou 2001), Makriyalos (Triantaphyllou 2001), Kouveleiki (Stravopodi pers. comm.), Kephala (Angel 1977), Tharrounia (Stravopodi 1993), Proskynas (Papathanasiou 2003, Papathanasiou *et al.* 2009), and Alepotrypa (Papathanasiou 2001, 2003, 2005).

As becomes readily apparent from the summary in Tables 14.1 and 14.2, there is an overall low prevalence of cranial injuries (3.5%; 13 of 370 Neolithic cranial elements), although the prevalence of soft tissue injuries cannot be ascertained. Cranial trauma consists mostly of small (up to 2 cm diameter), shallow, healed depressed fractures, which may have been induced by blunt objects such as stones or clubs. However, as mentioned above, due to the commingled and fragmentary nature of the collections, and their poor preservation, the actual prevalence may be underestimated. In particular, some individuals are represented by only a cranial fragment, which could artificially increase the number of observable elements and could lead to an underestimation of the actual prevalence. Furthermore,



Figure 14.1. Map showing Neolithic sites studied in this work.

there are no cases of embedded projectile points, although projectile points have been found in the archaeological context of all sites, albeit in small quantities relative to other stone tools. In terms of burial treatment, there is no differentiation between individuals with trauma versus those without, as they were buried in either ossuaries or simple flexed primary burials, with no significant offerings in either case. The results, however, become more interesting if sites are divided into subgroups or by the study of individual sites. All Neolithic examples are small, circular, sometimes multiple, and well healed at the time of death. Of the total 13 individuals that exhibited cranial trauma, 10

were male, two female, and one unsexed adolescent. The majority of fractures appear on the parietals, 10 of 13 Neolithic individuals, and if we account for multiple fractures on the same individual, then there are 14 parietal fractures and a total of 17 parietal and frontal fractures on the 13 individuals (see Table 14.2). The remaining three instances are on frontal bones. Regarding the location of the trauma on the cranium, five individuals exhibit a total of eight fractures on the left side while two individuals exhibit a total of two fractures on the right side, which may imply that the predominance of the injuries were inflicted by a right-handed assailant in a face-to-face confrontation. There is higher prevalence in the later Neolithic (4.0%; 12 of 303) than in the earlier periods (1.5%; one of 67) (Table 14.1), which is not statistically significant.

The prevalence of cranial trauma in the Mesolithic seems to be higher (9.5%; two of 21), which is statistically significant ($P < 0.003$), and is observed exclusively on males, although the sample size is very small to draw solid conclusions. One of these individuals, coming from a single flexed primary burial, exhibits five fractures. In detail, there are three cranial fractures, of which one is a healed depressed fracture and two unhealed depressed fractures on the frontal bone of

Table 14.1. Cranial trauma prevalence by site from Mesolithic and Neolithic Greece

Mesolithic	Franchthi (Mesolithic)	2/17	Angel 1969, 1973a, Papathanasiou forthcoming
	Theopetra (Mesolithic)	0/4	Stravopodi 1995
	Mesolithic total	2/21	
Early Neolithic	Pontokomi	0/3	Papathanasiou 2008
	Xirolimni	1/10	Papathanasiou 2008
	Mavropigi	0/20	Papathanasiou 2008
	Nea Nikomedia	0/34	Angel 1973b, Triantaphyllou 2001
	Early Neolithic total	1/67	
Late Neolithic	Makriyalos	0/72	Triantaphyllou 2001
	Tharrounia	0/38	Stravopodi 1993
	Kouveleiki	0/11	Stravopodi personal communication
	Theopetra (Neolithic)	0/29	Stravopodi 1995
	Franchthi (Neolithic)	0/46	Angel 1969, 1973a, Papathanasiou forthcoming
	Kephala	2/31	Angel 1977
	Proskynas	1/7	Papathanasiou 2003, Papathanasiou <i>et al.</i> 2009
	Alepotrypa	9/69	Papathanasiou 2001, 2003, 2005
	Late Neolithic total	12/303	

Table 14.2. Recorded incidences of cranial trauma

Site	Catalog no.	Sex	Age	Element
Franchthi (Mesolithic)	Fr1	M	25–30	frontal: 3 fractures
	Fr2	M	30–35	mandible
Xirolimni (Early Neolithic)	T.9	M	45–50	parietal
Proskynas (Late Neolithic)	XIV	M	45	parietal
Kephala (Late Neolithic)	17 KeK	M	35	frontal
	29 KeK	M	50 +	L parietal
Alepotrypa (Late Neolithic)	A15	M	30–35	R parietal
	A134	M	18	parietal
	A233	M	35	frontal
	A238	M	35–40	frontal
	A538	M	40	L parietal
	A559	M	30	L parietal: 2 fractures
	A235	I	15	L parietal
	A560	F	35–40	L parietal: 3 fractures R parietal: 1 fracture
	A2197	F	30	parietal

L, left; R, right.



Figure 14.2. Cranium with fr 1 multiple unhealed trauma from Mesolithic Franchthi Cave.

Fr1 resulting in two wounds with concentric fracture lines and radiating lines up to the coronal suture, which have affected the inner and outer table, and apparently caused death of the individual (Figure 14.2). There is also a broken incisor and a healed, probably greenstick, fracture on the first metacarpal of the same individual.

All Neolithic fractures are completely healed except one from Kephala, which was partially healed and recorded in 1960s by Angel (in Coleman 1977, p.136) (Figure 14.3):

...a serious penetrating wound just medial to and above the right frontal boss. The small hole $8 \times 11\text{mm}$ in size lies in the center of a 25mm diameter depression and has healed cuts around it, as if to remove a projectile point. The frontal bone behind this is locally thickened to 12–14mm from lamellar and diploic bone added to the inner table of the skull, apparently as a healing response after an extradural hemorrhage and blood clot. This inner thickening and the local remodelling of the outer surface place the injury a considerable time before the man's death in his middle 30s. Hostile action is much more likely as the cause than a sail-boat accident or similar hazard. If the

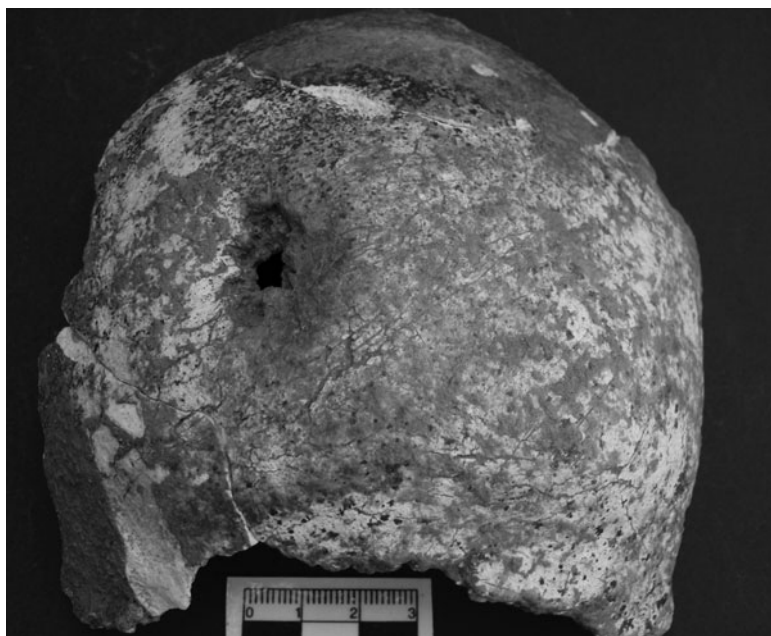


Figure 14.3. Cranium with healing injury from Neolithic Kephala.

injury and weapon had penetrated the dura, it is likely that infection in the sub-arachnoid space or in the brain would have been fatal.

The incidence of postcranial trauma is very low and, in several cases, it affects individuals that exhibit cranial trauma as well. Postcranial fractures consist mainly of compressed vertebrae fractures, a few rib fractures, parry fractures to distal ulnae, fractures to distal radii, and a spiral fracture on a femur. At most sites, postcranial trauma affects primarily females, except for Makriyalos, where it has been reported that more males are affected, especially in the lower part of the skeleton (Triantaphyllou 2001).

There is no episode of group violence at any site, except for a simultaneous multiple burial from Alepotrypa Cave, which involves eight young adult and adolescent individuals buried in an unexpected position, and missing a number of skeletal elements (Figure 14.4). In this multiple burial, there is one individual in an extended position and face down, which is not an expected burial position for this period, and a high number of disarticulated limbs. The burial includes one adult female, and seven subadult individuals ranging in age from five to 18. No traumatic lesion could be seen on any of the individuals; therefore, this burial cannot be attributed to violence alone, barring other possible causes.

Summing up, cranial depressed fractures during the Greek Neolithic are consistent with face-to-face fighting with blunt objects, and indicate that interpersonal conflict was not as rare as previously assumed, especially among men. The aforementioned elevated frequencies of



Figure 14.4. Multiple burial from Neolithic Alepotrypa Cave.

cranial injuries in males indicate that violence was actually a 'male business' at these sites. The data also suggest sporadic violence and does not support a case of endemic warfare, as there is no age and sex differentiation, and there is a lack of the gruesome pattern of frequent multiple traumas characteristic of larger-scale intergroup violence. Most of the evidence for violence points to non-lethal, face-to-face combat among men, and could be sporadic episodes, either within the community or between groups. Again, the restricted sample size does not support any statistical analysis to identify significant increases or decreases through time, except between the Mesolithic and Neolithic.

ALEPOTRYPA CAVE

One of the aforementioned sites provides evidence for a more elaborate interpretation. Alepotrypa Cave (Papathanassopoulos 1971, 1996), which has yielded the largest Neolithic osteological series in Greece, also exhibits the highest prevalence of cranial trauma (13.0%; nine of 69 individuals) (Papathanasiou 2001, 2005).

Cranial depressed fractures are frequent in the series (Figures 14.5 and 14.6). Again, they are small, circular, and sometimes multiple and well healed, which seems to indicate they did not cause significant damage and are suggestive of interpersonal aggression and conflict but not of lethal encounters. Combining these data with other evidence from the archaeological context of the site may lead to an interesting hypothesis.

In the Alepotrypa Cave, we observe the first attempt to separate the area of the living from the area of the dead by the formation of two ossuaries for secondary burials.

Second, the Alepotrypa population has a high prevalence of metopism, with 14.7% (five of 34 individuals) of older subadult and adults displaying complete metopism. Interestingly, four of five individuals with metopism come from Ossuary II, which has an incidence of four of 13 (30.8%). As inferred statistically, metopism is significantly higher in Ossuary II with respect to the rest of the population, from which we can deduce a genetic affinity for that segment of the series. Metopism generally appears sporadically and infrequently in most populations. Some of the highest frequencies (11.3–13.7%) are found in eastern Asian and European populations (8–12%) (Hauser and De Stefano 1989).



Figure 14.5. Healed depressed cranial fracture from Neolithic Alepotrypa Cave.



Figure 14.6. Healed depressed cranial fracture from Neolithic Alepotrypa Cave.

In general, assessments up to now reveal habitation on a marginal area characterized by: (1) a land-based agricultural economy and a terrestrial, mainly cereal, subsistence, as indicated by stable isotope analysis (Papathanasiou 2003); (2) a relatively high degree of interpersonal violence, as expressed by the elevated number of cranial fractures, especially in Ossuary II; (3) possible familial relationships between the individuals buried in Ossuary II, based on the high incidence of metopism; and (4) a population increase as indicated by the high (0.276) fertility rate.

THE WIDER CONTEXT

In Europe, evidence of violence has existed since the Epipalaeolithic and Mesolithic (Newell *et al.* 1979, Guilaine and Zammit 2001). The evidence from Greece does not include large-scale violent events such as the mass graves of central Europe in Asparn/Schletz in Austria (Teschler-Nicola *et al.* 1999), Talheim in Germany (Wahl and König 1987), or cases with embedded or related arrowheads, more common in western Europe (see other chapters in this volume). Violence in the Greek Neolithic bears more similarities to evidence from Lepenski Vir (Roksandic *et al.* 2006), Spain (Jimenez-Brobeil *et al.* 2009), or the British Neolithic (Schulting and Wysoski 2005) with relatively low cranial trauma prevalence of 3.7%, 11.5%, and 4–5% respectively; low frequency in subadults and females (except the latter sample), predominance of small, shallow, healed cranial fractures, usually on the left side of the cranium, implying right-handed aggressors and suggesting non-lethal ritualized combat for dispute resolution.

Ritualized combat is more likely to occur in conjunction with more widespread, intercommunity violence, but also the awareness of the potential of violence as a form of social action could be an appropriate means of conflict resolution (Schulting and Wysoski 2005, p.129). Intergroup violence need not be lethal in intent or outcome and may have served to define more tightly the cohesion of the group, while violence within the group can be used in various levels to coerce and intimidate others, and to define identities and social positions (Schulting and Wysoski 2005, p.130). The motivation for violence in small-scale societies may include innate aggression, revenge, material gain, and acquisition of status, while in the form of raiding it is more

associated with pastoral societies, especially when they are committed to a mixed farming–herding way of life, which reduces their mobility and choices. In addition, the landscape, which becomes increasingly populated and increasingly subjected to claims of ownership and use rights, becomes more of a factor (Schulting and Wysoski 2005).

Outside Europe, high levels of healed cranial trauma have been reported in unrelated populations pursuing various adaptive strategies, such as foraging communities in Australia (Webb 1995), Chilean Chinchorro populations (Standen and Arriaza 2000), the Yanomami of Brazil (Chagnon 1988), and southern California coastal populations (Walker 1989). These investigations reveal a common theme for populations with elevated cranial trauma. That is, in these settings, populations were living in marginal circumstances involving environmental deterioration, population stress, and competition for increasingly limited resources, factors linked with violence (Walker 1989; Milner 1995; Larsen 1997). The causes of interpersonal violence in the Alepotrypa Cave population cannot be determined but some level of violence was present. However, all observed cranial trauma is healed, suggesting that intentions of the aggressors may not have been lethal (see Webb 1995). This pattern is similar to the presence of predominantly healed trauma in prehistoric native populations from the Channel Islands off the coast of southern California (Walker 1989).

Before the Neolithic, no great inequality of status is evident while a durable form of social inequality was already established by the Bronze Age. In the absence of evidence for inequality in mortuary patterning, usually the Neolithic societies are assumed as egalitarian, with lack of personal status differentiation. In the Neolithic context, however, the presence of regional identity as evidenced by the geographical distribution of some objects and styles, well-known Neolithic regionalism, exchange networks, and specialization in production, would seem unlikely without some form of status differentiation.

A full-scale farming economy, year-round sedentism, and more social complexity emerged during the Neolithic. In this context, arable land, and possibly pasture and water, could have been critical but restricted resources (i.e. restricted in distribution, access, or amount) for local populations. It is within the context of subsistence-settlement systems, demographic, and social processes, which include rising social complexity and invocation of the ancestors as a key element in social strategies that a model was designed and justified. It states that groups are more likely to maintain formal

disposal areas for the dead rather than dispersed grave sites when control of restricted resources is crucial (Saxe 1970; Goldstein 1976; Charles and Buikstra 1983; Chapman 1990, 1995). Thus, this model links the appearance of formal disposal areas or cemeteries with increasing populations, changes in subsistence, and reduced mobility (Cullen 1995). Although we cannot know what was in the minds of Neolithic people, we can speculate that they were acting within the aforementioned socio-economic framework.

It would have been in the best interests of an increasingly sedentary and stressed group living in a small area, where resources that formed the basis of their subsistence and economy, such as arable land and water, were limited, with aggression and competition over them, to mark social differences in a way that would preserve community ties and at the same time sufficiently control access to resources (Cullen 1995). It seems tempting to suggest that creating specific places for successive placement of the dead, probably with familial relationships, may emphasize one or more subgroups' claim or attachment to the site and surrounding resources, while simultaneously creating a collective memory of the past. Within this context, where people had to defend their economic interests, secondary burials are viewed as an attempt to create ancestral authority and inheritance, and establish control of critical resources.

In conclusion, this chapter has provided a review of all traumatic lesions recorded in all published Greek Neolithic populations, to investigate the presence of interpersonal violence in early non-state societies. The evidence points towards a low to moderate prevalence of violence in the form of hand-to-hand combat with clubs or blunt objects, and probably stones (Standen and Arriaza 2000), mainly among males, resulting, most often, in non-lethal head injuries. Specifically, in Alepotrypa Cave, violent episodes can be placed within a tentative social and economic framework.

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Prehistoric violence in northern Spain: San Juan ante Portam Latinam

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ABSTRACT

San Juan ante Portam Latinam (Laguardia, Álava, Spain) is a small rock shelter located in the middle valley of the River Ebro, where a large number of individuals were buried at a time of transition from the Neolithic to the Chalcolithic (ca. 3000 cal BC). It is an outstanding archaeological site, due to the atypical choice of site for burials, large number of bodies, and numerous signs of violence observed. The population at the site comprises a minimum number of 338 individuals belonging to both sexes and all age groups. They display various kinds of pathologies, including at least 11 arrow wounds and four trepanations. The human remains are accompanied by a series of objects, such as lithic and bone implements, as well as personal objects of adornment. Among the few faunal remains found, a dog's skull shows signs of decapitation. The site was sealed by the collapse of the rock overhang of the shelter, until it was discovered accidentally in 1985. A rescue excavation was carried out in that year, and this was followed up by two further excavations in 1990 and 1991. They were all directed by José Ignacio Vegas, under the sponsorship of the *Diputación Foral de Álava*.

SITE LOCATION AND DESCRIPTION

The archaeological site of San Juan ante Portam Latinam (SJAPL) is located near Laguardia, in the region of *Rioja Alavesa* in the southern Basque Country, between the Sierra de Cantabria and the left bank of the River Ebro (Figure 15.1). This area contains a large group

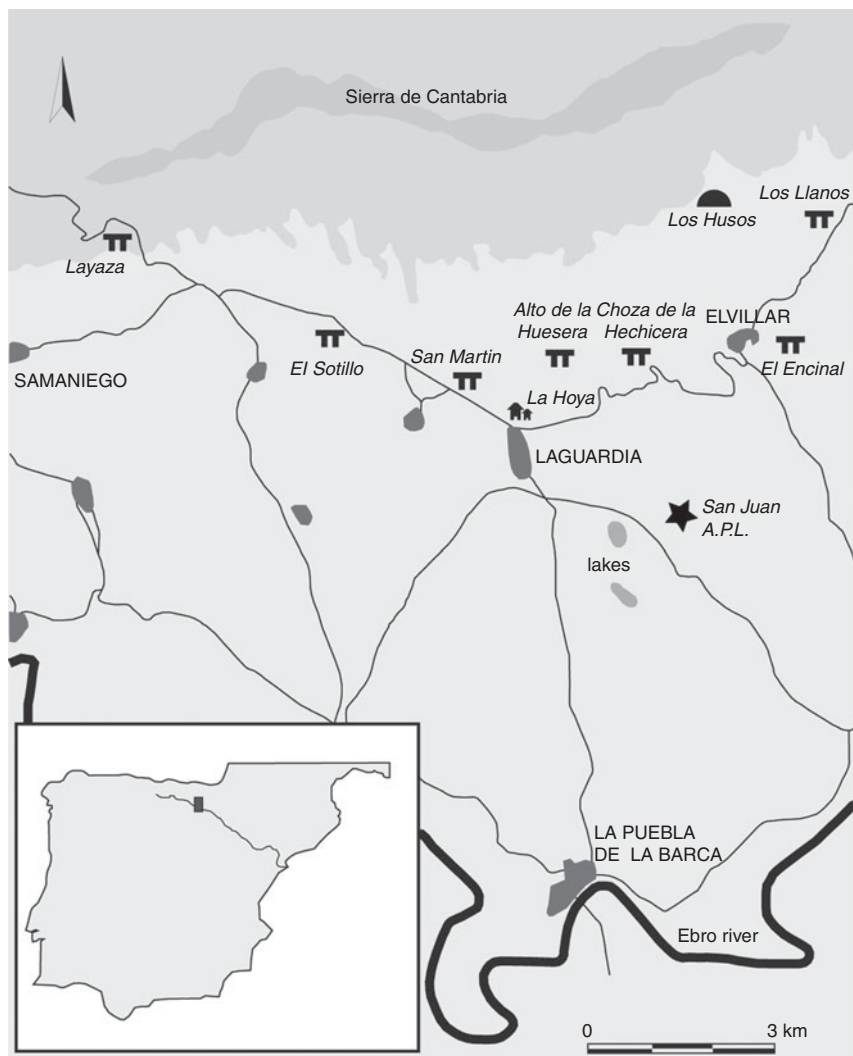


Figure 15.1. Location of San Juan ante Portam Latinam, in the Ebro Valley, and other nearby archaeological sites.

of important prehistoric sites, including an outstanding group of megalithic burials (Figure 15.2) among many other prehistoric monuments.

The dense prehistoric population can be explained by the fact that it is an area with abundant resources, highly suitable for cereal agriculture (its characteristic vineyards are relatively recent in origin) in the lowlands, where the fields on the banks of the Ebro can be irrigated. At the same time, the highlands of the Sierra can be used for pastures, as well as for woodland resources. In addition, the valley has always been an important communication route and a natural way of penetrating into the hinterland of the Iberian Peninsula from the Mediterranean region.

From the geological viewpoint, the site is located in the Tertiary formations of the western Ebro depression, in its typical Miocene continental facies, to be precise in the so-called Haro Facies. This formation outcrops as alternating sandstone and clay beds, ochre and yellowish in colour. The present-day peneplain contains a number of



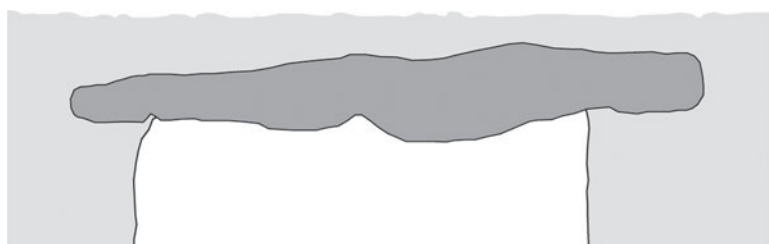
Figure 15.2. The Witch's Hut (*La Choza de la Hechicera*), megalithic burial near SJAPL.

enclosed valleys, some of which are occupied by small lakes. In recent times, possibly coinciding with the time when burials took place, one of these lagoons might have existed next to the site. At this time, according to the palynological study (Iriarte 2007), the area around the site formed an open landscape that was already anthropized, with herbaceous plant cover and an arboreal strata consisting mainly of *Quercus robur*, *Corylus*, and *Pinus* sp.

San Juan is a small cave or rock shelter formed because of the above-mentioned alternating geological beds, favouring differential erosion. Consequently, a hollow was created in the clayey strata, facing south, which was covered by a layer of the harder sandstone in the form of an overhang or natural roof. This compact sandstone bed fractured and collapsed, almost certainly at a date long in the past, covering and protecting the deposit until recent times (Figure 15.3).

In April 1985, a bulldozer that was widening the track that runs next to the site accidentally uncovered a number of human bones when it cut through a side bank. After initial police examination, a local man, Lorenzo Ugarte, informed Armando Llanos, who was then the Director of the Culture Department in the Álava local government, about the discovery. The latter was able to verify that the rock shelter contained a large deposit of human remains with some prehistoric archaeological artefacts. He immediately decided to undertake a rescue excavation. This was directed by José Ignacio Vegas; it lasted until August, and recovered a large collection of human bones and other archaeological material. However, the conditions of the site, especially the presence of enormous boulders fallen from the original roof, did not allow excavation to continue beyond a certain point and it had to be halted.

In 1990, J.I. Vegas, equipped with more appropriate means, necessary time, and funding from the Diputación Foral de Álava, decided to undertake the definitive excavation of the site (Figure 15.4). The work began with a controlled explosion, using gunpowder charges, to break up the large sandstone block (over 25 tons in weight), which had held up the excavation. Once the rubble had been removed, remains of the deposit could be seen, covering a clearly delimited area of some 12 m², entirely covered by an impressive accumulation of human bones, both skeletons in perfect anatomical connection and apparently isolated bones. The roof collapse had seriously affected many of the remains located on the western side, and crushed them to a layer a few centimetres thick, but those on the opposite side were protected in a



c. 3000 AC



1985 AD

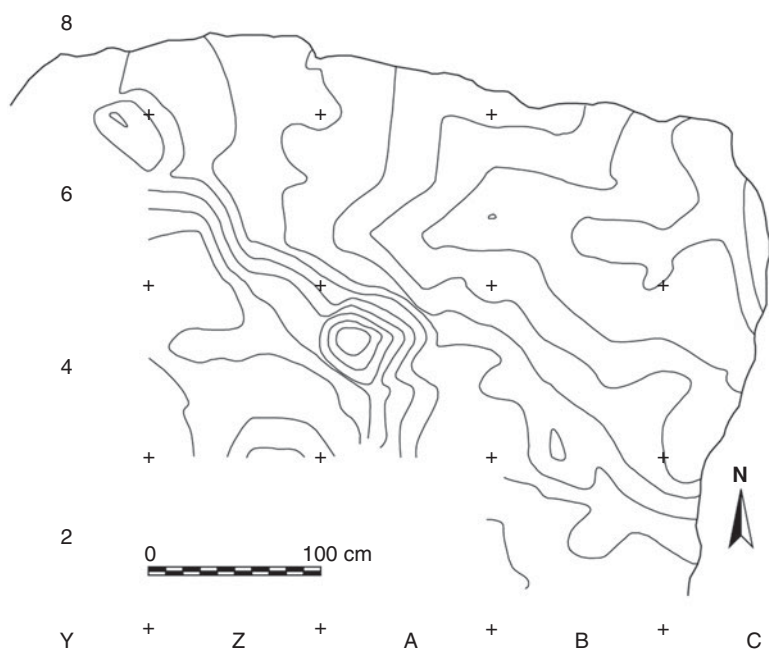


Figure 15.3. Cross-section and plan of the rock shelter, with the excavation quadrants.

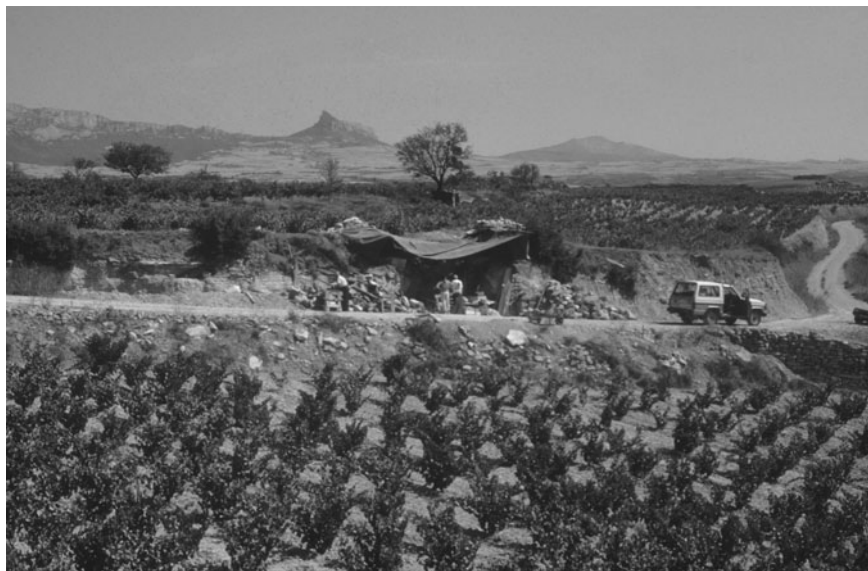


Figure 15.4. The site, situated among the typical Rioja vineyards. Note the track that cut through the deposit and was the cause of the discovery.

hollow left under the large fallen sandstone block (Figure 15.5). The excavation was necessarily slow and complex and took place over two seasons in 1990 and 1991, until the final remains were recovered.

During the course of the work, it was seen that the rock shelter, which was fully occupied by the burials, had a roughly semicircular surface area, although its exact size could not be determined because, as has been said, the front part of it had been dug away and destroyed by the track. In any case, given the natural slope of the ground where it is situated, it does not seem that it could have extended over more than 20 m². The average height must have been approximately 1.75 m. Currently, the site is walled off and covered over to make good the damage caused to the owner of the vineyard situated above it.

THE GRAVE GOODS

The use of the term ‘grave goods’ in its strictest sense does not seem appropriate at this site because, as we shall see, at least part of the

objects discovered at SJAPL are not the result of an intentional deposit but reached the site accidentally. However, we wish to refer to all the objects found in the burial, apart from the human remains. They are of two kinds: on the one hand a considerable number of manufactured goods and on the other, a few faunal remains.

The lithic assemblage

A total of 131 lithic implements have been found. Apart from two polished artefacts and an ophite flake, these are all made of flint. In the vast majority of cases, they are retouched pieces, as is usual in funerary contexts, although some blades, simple flakes, and knapping waste have also been found.

The most common objects are arrowheads with flat bifacial retouching. They amount to a total of 61, which makes up almost half the lithic assemblage (Figure 15.6). Their shapes and sizes vary, but show the same general traits, and form a quite homogeneous collection. They can be included within two general types: simple foliate points and tanged points. Other arrowhead types are completely



Figure 15.5. Accumulation of human remains on the eastern side of the rock-shelter (1990 excavation).

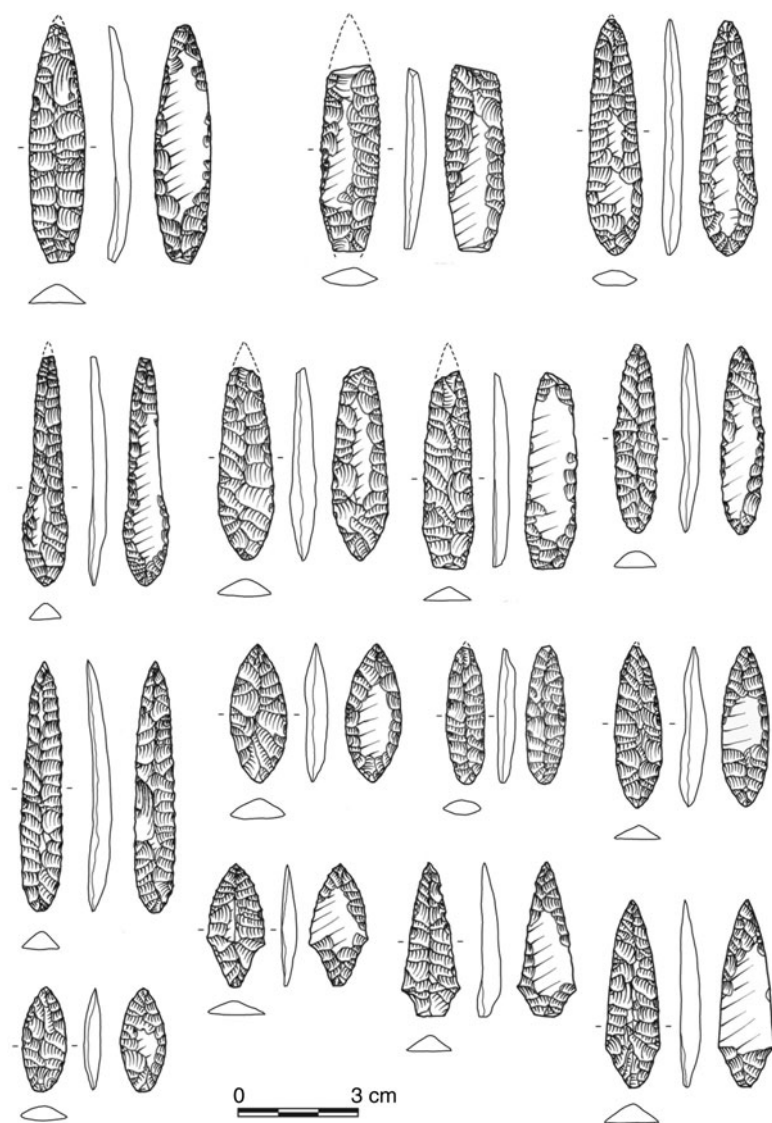


Figure 15.6. Arrowheads of different types and sizes.

absent: points with straight or concave base, typical of other parts of the Iberian Peninsula; microlithic armatures, belonging to earlier periods; and the barbed and tanged points characteristic of the fully Chalcolithic age.

The simple foliate points include the longest examples, about 6 cm in length, and the heaviest, over 4 g in weight. Certain typological variety can be recognized in this group, ranging from long or spear-shaped points, in some cases with wide bases, to other shorter specimens with a more ogival or diamond-shaped outline. The group of tanged points is somewhat more heterogeneous, relatively speaking. In some cases the outline of the tang is very faint, simply the consequence of slightly deeper bifacial retouching in the proximal part. In other cases, however, the tang is more noticeable, as the result of clearer intentionality. Some of these specimens display slight lateral appendices.

The characteristics of the flat retouching are very similar in both groups. This retouch may cover both faces but, with far greater frequency, it covers or nearly covers only the dorsal face whereas on the ventral face retouching is limited to the proximal area (for hafting) and distal end (to sharpen the point). The rest of the face is flat or has simple invasive retouching, which is sometimes only partial. On occasions, the edges are slightly denticulate. In most cases, the platforms have not been preserved due to retouching to trim and round off the proximal end of the pieces.

These arrowheads are a common type in the later Neolithic and Early Chalcolithic, as has been documented at several sites in the Ebro Valley and in Cantabrian Spain (Ontañón 2002). SJAPL can now be added to this group of sites thanks to a large number of radiocarbon determinations (see below) that date the funerary deposit with its foliate arrowheads precisely to the Neolithic–Chalcolithic transition.

In view of the circumstances and according to our general interpretation of the site, we strongly believe that the flint arrowheads found in the rock shelter do not form part of the grave goods deposited with the deceased, but were lodged in the bodies themselves. We know this for a fact in 13 cases (see below), but others can probably be added, given their position in relation to certain skeletons. At the same time, this hypothesis is supported by the fact that many arrowheads (41 or 67% of the total) are incomplete, and are missing their apex or a larger part of the distal end. Use-wear analysis suggests that most of these fractures were caused by the impact of the

projectile. It is interesting to note that at SJAPL arrowheads of very different proportions and weight were used as weapons of war, apparently with equal effectiveness. Some of the injuries that have been identified were caused by some of the largest and heaviest points in the deposit, whereas others are due to the impact of considerably more modest and roughly made projectile points.

After the arrowheads, the second largest group of lithic implements found at SJAPL is formed by a series of knapped blades, many of them worked by the same type of flat retouching. Some are quite large in size (up to 11 cm). Possibly, they are simply knives, although some of them were carefully manufactured, even displaying inverse partial retouching at their base, probably to be hafted. At least one of them was used to process plant matter, according to the use-wear analysis. Together with these implements were found three end-scrapers on blades and another object, which could be classed as a burin. The only polished stone implements are a good-sized adze and a small axe or chisel made from an exotic stone-type.

Bone utensils and pottery

The bone assemblage consists of five punches made from diaphysis fragments whose ends were sharpened by polishing. One of these, made from the tibia of a hare, preserves the epiphysis as a handle. In addition, another diaphysis fragment has a rounded end, perhaps to be used as a spatula or smoothing tool. A wild boar tusk was cut and one of its ends rounded, for an unknown purpose. Only seven small sherds of undecorated hand-made pottery have been recovered.

Objects of personal adornment

These are mainly simple pendants or beads made from stone (11 examples) or lignite (36 examples), and are generally small. Their spatial distribution suggests that they formed part of just a few ornamental items, which would therefore be attributed to only a few individuals. Additional finds include a pendant made from an atrophied red deer canine, three perforated shells (two of *Trivia* sp. and one of *Nassarius reticulatus*), and some 200 specimens of *Dentalium* sp. The *Dentalia* formed part of three necklaces; one of these, consisting of over a hundred shells, was located around the cervical vertebrae of an infant. The use of the shells of marine molluscs



Figure 15.7. Necklaces made from pairs of wild boar tusks.

implies direct or indirect contacts existed between the population at SJAPL and coastal regions. These contacts were already known to exist in the region of the Ebro Valley, at least since the Mesolithic. Unfortunately, it is not possible to determine whether they were from the Mediterranean or the Bay of Biscay.

However, the most striking objects of personal adornment recovered at SJAPL are made from wild boar tusks. Four necklaces were made each with a pair of these tusks, coming in each case from the same animal (Figure 15.7). Additionally a single tusk was found, part of another similar necklace where the complementary tusk appears to have been lost. Each tooth contains one, two, or three perforations through the root and another perforation at the distal end, so they could be strung and worn around the neck. They must have been valuable objects, as several of them were repaired by making new perforations after the first ones broke. One of these necklaces was found over the abdomen of a mature woman.

Another two objects were made from fragments of boar tusks. In this case, they are simple pendants, also reused after breaking. One of these was found on the chest of a young adult male, almost certainly in its original position. Pendants made from boar tusks are common in the Neolithic and Chalcolithic in nearby Mediterranean regions,

such as the French Midi and Catalonia (Muñoz 1965). A similar necklace to those at SJAPL was found at the Early Neolithic burial cave of L'Avellaner (Girona) (Bosch and Tarrús 1990).

Faunal remains

Very few faunal remains have been found, and most of them belong to lagomorphs, so their presence is probably accidental. Very different is the find of a small dog skull, without doubt placed intentionally in the burial and can be considered a true funerary offering. It preserves the five first cervical vertebrae, one of which (the third) shows unmistakable signs of decapitation by a sharp instrument.

CHRONOLOGY

A series of 10 radiocarbon determinations have been made for the site. Two of these were obtained during the 1985 excavation and the others during the last two seasons (1990 and 1991). Analysis of the samples was carried out at three different laboratories: Teledyne Isotopes (New Jersey, USA), Groningen, and Uppsala, and by two different methods: conventional radiocarbon dating and AMS. The results are given in Table 15.1. The homogeneity test applied to the whole series of dates gives a negative result, as might be expected.

Table 15.1. Results of the radiocarbon determinations obtained for SJAPL

Age ^{14}C BP	cal BC (2σ)*	Lab. no.	Name	Sample
5070 $\pm$ 150	4246-3532	I-14842 (C)	SJAPL-85B	Human bones (1985)
5020 $\pm$ 140	4228-3520	I-14594 (C)	SJAPL-85A	Human bones (1985)
4570 $\pm$ 40	3496-3103	GrN-21772 (C)	SJAPL-3	Human bones
4520 $\pm$ 50	3366-3030	GrA-5428 (AMS)	SJAPL-5	Human bone
4520 $\pm$ 75	3497-2932	Ua-10355 (AMS)	SJAPL-7	Human bone
4510 $\pm$ 40	3361-3090	GrN-21770 (C)	SJAPL-1	Human bones
4460 $\pm$ 70	3350-2928	Ua-10356 (AMS)	SJAPL-8	Human bone
4440 $\pm$ 40	3333-2927	GrN-21771 (C)	SJAPL-2	Human bones
4325 $\pm$ 70	3326-2702	Ua-10357 (AMS)	SJAPL-9	Dog bone
4200 $\pm$ 95	3018-2494	Ua-10415 (AMS)	SJAPL-4	Human bone

*The dates were calibrated by CALIB 5.0.1 (Stuiver *et al.* 2005).

†C (conventional) or AMS

This is because the first two, obtained in 1985, have results that are too old and have a large standard deviation. We believe that they can be discarded, in light of dates obtained later. There are also problems with the sample SJAPL-4, because it gives a date that is too recent. Although it is not too different from the mean of the other determinations, we are inclined to discard it because of the larger standard deviation, and because SJAPL-3, which dates the same bones, gives a different result that is wholly coherent with the other determinations.

Once the three dates mentioned above are omitted, the other seven form a homogeneous group, overlapping perfectly, whose mean indicates, with 95% probability, a chronological period between 3338 and 3095 cal BC (Figure 15.8). The deposit of the burials in the rock shelter at SJAPL should be attributed to this time. In the same way, geological and palaeobotanical studies coincide in proposing a more humid climate than at present was in existence. This moment, at the end of the fourth millennium cal BC, corresponds culturally with what

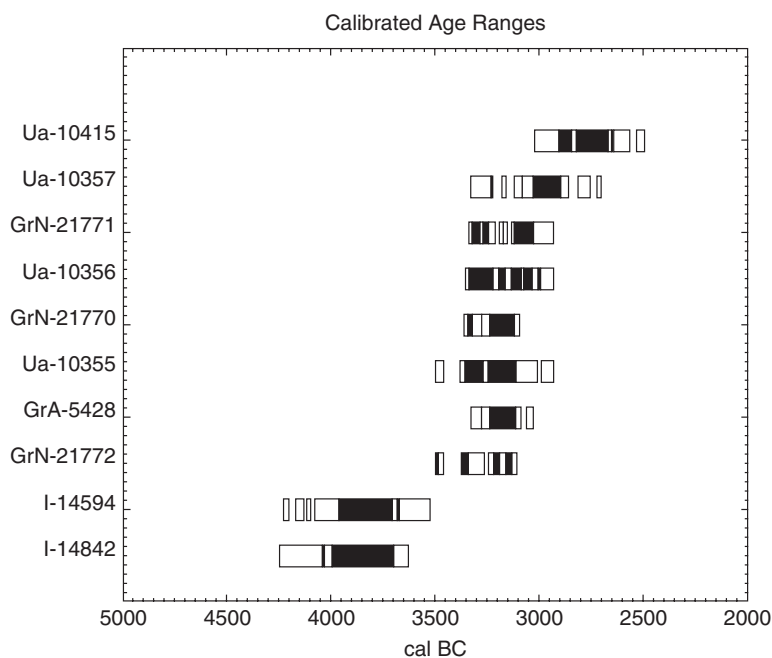


Figure 15.8. Radiocarbon determinations from SJAPL (calibrated following Stuiver *et al.* 2005).

is believed to be the transition between the Late Neolithic and Early Chalcolithic in the region. It is apparently characterized by the start of a significant population increase, reflected in a growing density of occupation sites and funerary deposits across the whole territory.

This period has been well documented at several other sites in the middle Ebro Valley, with reliable chronologies and similar archaeological materials to those at SJAPL. However, because of its clear parallels (see below) and proximity, the hypogeum at Longar (Viana, Navarra) can be highlighted: its series of six radiocarbon determinations runs parallel with that of our site (Armendariz and Irigaray 1995).

THE BURIALS: ANTHROPOLOGICAL AND PALAEOPATHOLOGICAL STUDY

Apart from the remains recovered from the area situated outside the protection offered by the large rock fallen from the roof, in general it can be stated that the anthropological collection is well preserved. In fact, one of the basic aspects to understand the funerary deposit is rooted in this relatively good state of conservation and regularity with which the human remains appeared in anatomical connection, as they were uncovered during excavation. However, the compression and weight of the collapse fragmented many of the remains so that it was very difficult to recover them completely. Equally, not all bone remains from the site are available for study because, as described above, the discovery occurred accidentally when the track was being widened.

The skeletons in anatomical connection were found in direct contact with the surrounding skeletons, without any sediment apart from the clay and sand that had infiltrated the deposit over the years and filled all the interstices. The bodies were deposited one above the other, in flexed or semi-flexed postures. The superimposition of one above the other meant that, during the decomposition process, most of the bones did not move or alter their position. This is known as burial in a filled space (Chambon 1999), where it was not earth or any other substance filling the spaces but other superimposed bodies



Figure 15.9. Reconstruction of the best-preserved skeletons on the eastern side of the rock shelter (the outline of the large slab of rock fallen from the roof is drawn over them).

(Figure 15.9). A large number of bodies, over 300 individuals, were buried in a very small space of approximately 6×4 m. The maximum depth of the only layer in the deposit is only 70 cm. In other words, all the bodies had accumulated within a volume of about 16.8 m^3 . This means that skeletons were compacted and interwoven with one another. Consequently, their recovery was a difficult and arduous task.

In this respect, the presence of anthropologists on site was of fundamental importance, to individualize and follow the anatomical connections as they were detected. A further member of the team was exclusively occupied in drawing plans of the skeletons' positions and their anatomical connections. While the relationships of anatomical connection noted in the excavation are denominated as first-order relationships by Duday (1987, p.53), the reconstructions resulting from the anthropological study in the laboratory are classified by

the same author as second-order relationships. To establish these relationships, the inventory and database prepared beforehand have proved to be of vital importance.

The whole area inside the small rock shelter was used for burial and it thus became filled with skeletons. In the best-preserved areas as many as eight layers of skeletons are superimposed, with no separation between them. Although the cadavers were deposited intentionally, they were not placed in any predetermined order. The bodies were distributed at random to optimize use of the available space. They were generally found with their limbs flexed against the torso, and predominantly placed in a supine position with the backs fully supported. The legs were bent double, in such a way that the tibia and fibula are almost in contact with the femur, and feet are next to the hips. The arms were also folded over the thorax and pelvic zone (Figures 15.10–15.12). It is reasonable to



Figure 15.10. Two complete skeletons at the eastern end of the burial.

imagine that to place the cadaver in this position it was necessary to bind up the limbs during the time when the muscles were relaxed, possibly after the period of *rigor mortis* (i.e. a little over 48 h after the time of death, the cadaver could have been manipulated to force it into this folded posture).



Figure 15.11. Skeleton in a bent posture.

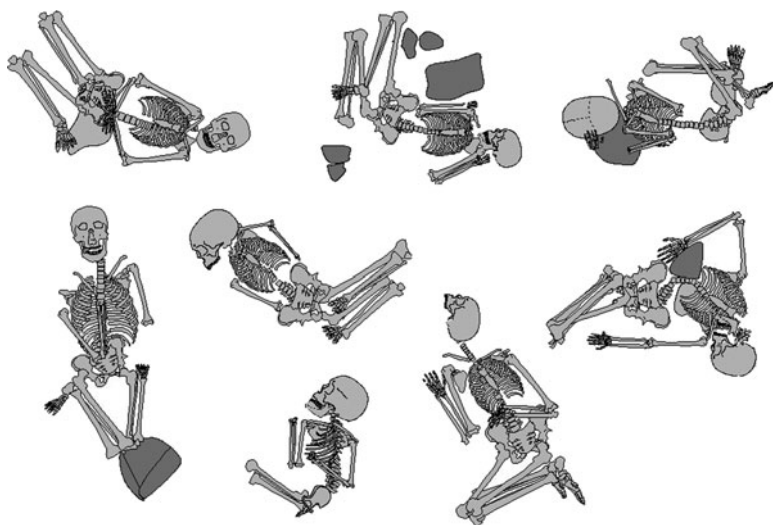


Figure 15.12. Postures of some of the individuals buried at SJAPL.

Population structure of the burials at San Juan ante Portam Latinam

Age and sex determination

The methodology used to determine age and sex followed the international guidelines of the WEA (Workshop of European Anthropologists, Ferembach *et al.*, 1980) and those in *Standards for Data Collection from Human Skeletal Remains* (Buikstra and Ubelaker 1994). The main criterion to establish age in the subadult population was dental calcification and eruption (Liversidge *et al.* 1993). This was of great importance in the collection's anthropological study, as 60% of the population had not reached skeletal maturity. The distribution in the main age groups for subadults or immature individuals is: infant I (children under 7 years), infant II (7–12 years), and juvenile (12–20 years); and for the adults: young adult (21–40 years), mature adult (41–60 years), and senile adult (over 60 years). The minimum number of individuals (MNI) is 338.

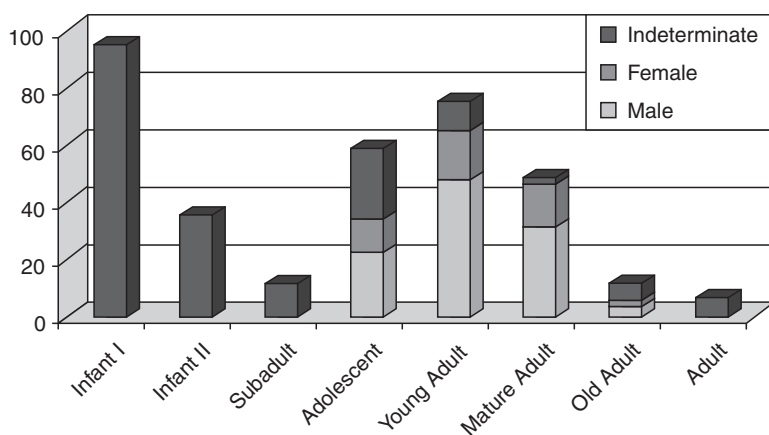
Age and sex distribution

The sex distribution shows a predominance of males. Thus, of 153 individuals for whom sex could be determined, 70% were males and

Table 15.2. Sex distribution of the population present at SJAPL

Age group	Male	Female	Indeterminate	TOTAL
Infant I	–	–	95	95
Infant II	–	–	36	36
Subadult	–	–	12	12
Adolescent	23	12	24	59
Young adult	48	17	10	75
Mature adult	32	15	2	48
Old adult	4	2	–	6
Adult	–	–	7	7
Total	107	46	185	338

30% females (Figure 15.13). As can be seen in Table 15.2, representation of infants younger than 10 years old is very important, as between both groups they make up over a third of the population (36.69%). Some 7% of the population were under 5 years of age. Altogether, 58% were under 20 years old or had not reached skeletal maturity. By comparison, only 1.8% had reached advanced age. This proportion between the subadult or immature population and the adult individuals has been described by several authors (Bocquet-Appel and Masset 1977; Masset 1986) as significantly informative about the type of population. Life expectancy at birth is 20.3 years. This figure is at the lower limit of the range between 20 and 30 years, which is considered typical for a pre-industrial population.

**Figure 15.13.** Age groups of the population present at SJAPL.

Palaeopathology of the human remains

In the first place, lesions and other evidence caused by disease are no different from those described at sites of the same or similar chronology. In reality, if we take into account the limited life expectancy, the likelihood of contracting diseases that can be recognized on bones is relatively small. None the less, some degenerative lesions have been detected and other less frequent ones, such as the neoplastic lesions that appear to have affected two of the individuals. As in many other direct research projects, from the viewpoint of palaeopathology, we are aware of interpretative limitations when attempting to establish a retrospective diagnostic and assess the finds in epidemiological terms.

However, the traumatic lesions are much more significant, as in 13 cases, lesions have been identified that were produced by the impact of arrows on the skeleton. In many of these cases, the arrowhead became embedded in bone, sometimes followed by survival of the individual who suffered the injury.

Traumatic lesions

Among the traumatic injuries, mostly arrow wounds, making up the main part of this section, we can distinguish the following:

- arrow wounds with embedded projectiles;
- other probable injuries caused by arrows;
- traumatic injuries in general.

Arrow wounds

From the time of the first excavation in 1985, it could be seen that this funerary deposit contained skeletons with injuries directly caused by arrows. Since then, the number of cases has increased, not only through finds *in situ* and direct observation of this kind of wound in the deposit during the 1990 and 1991 seasons, but also during the later study of the remains and the correlations made with a full understanding of the site and its interpretation. In this way, the list of wounds diagnosed as certain contains the following cases (Figure 15.14).

- *Case 1 (SJAPL 36)*. This is part of the ischium of the right hip bone, which in the centre of the internal face, at the height of the lesser sciatic notch, has a rhomboidal orifice 12 mm long by

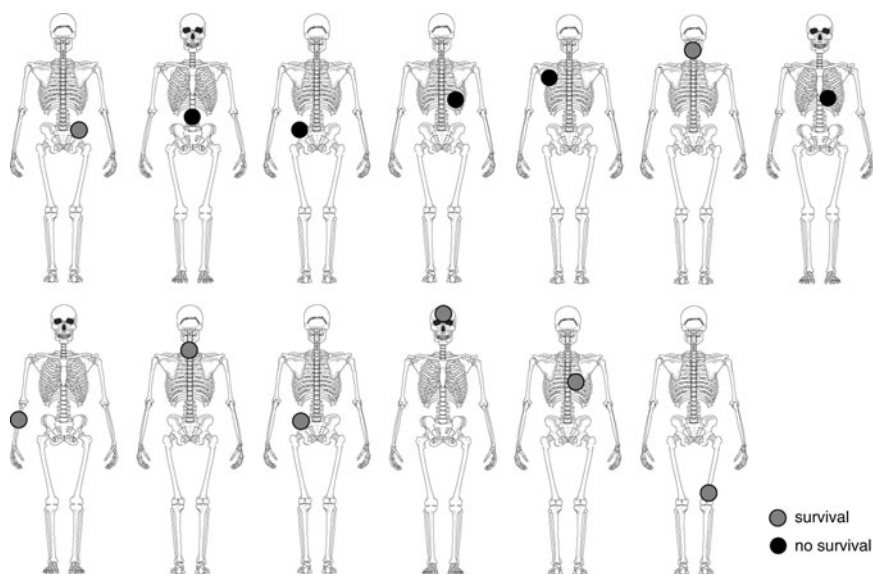


Figure 15.14. Certain cases of arrow wounds documented at SJAPL.

8 mm wide. This orifice continues in the form of compact tissue almost perpendicular to the interior of the bone. A flint arrowhead was found lodged inside this. While the individual was alive, this must have impacted on the right gluteus region, from behind, from below upwards, and from left to right (Figure 15.15). The individual was an adult of indeterminate sex.

- *Case 2 (SJAPL 99).* The arrowhead was found in the vertebral body of the first lumbar vertebra, where it was in a transversal position. If the location of the point in relation to the vertebra is taken into account, it is reasonable to propose that it entered on the individual's right side with a subhorizontal trajectory. There are no signs of healing. The individual was a young adult male.
- *Case 3 (SJAPL 154).* Arrowhead lodged deeply next to the iliac crest of the left hip bone, breaking part of the bone around the wound. There are no signs of healing. The arrow impacted from behind, from above downwards, and from left to right (Figure 15.16). This case is particularly interesting if we consider that this wound probably was not the cause of death and, as there is no evidence of survival after wounding, it may be assumed that



Figure 15.15. Case 1. Hip bone fragment with the arrowhead lodged in the hole made by the wound.

the individual must have suffered other injuries of which no direct evidence can be seen on the bones. This circumstance brings us face to face with the true limitations of palaeopathology and allows us to infer other considerations that can be extended to other cadavers at SJAPL, even though they do not have any arrowheads piercing their bones. The individual is a mature adult male.

- *Case 4 (SJAPL 170).* An arrowhead fragment penetrated through an intercostal space in the right hemithorax and was found between the ribs. There are no signs of healing. It is reasonable to suppose that it could have caused the individual's death as it fragmented in the impact against the body. The arrow hit the individual from behind, from right to left, and subhorizontally. This individual is a juvenile male.
- *Case 5 (SJAPL 199).* On this occasion, the arrowhead penetrated perpendicularly through the left scapula of an individual in anatomical connection. There are no signs of healing. The arrow impacted from behind and subhorizontally. The individual is a mature adult male.
- *Case 6 (SJAPL 123).* The arrowhead was found at the nape of the neck where it had lodged. It was surrounded by a deposit of new



Figure 15.16. Case 3. Hip bone with an arrowhead lodged in the iliac crest.

bone, indicating healing. In fact, it is fixed to a flake of the occipital bone by a piece of tissue grown in the direction of some of the powerful muscle insertions in the nape. The arrow impacted from behind, from left to right, and subhorizontally, remaining within the muscle group as a 'foreign body' until the individual's death (Figure 15.17). The individual is a young adult male.

- *Case 7 (SJAPL 343).* The arrowhead went through the eighth thoracic vertebra body until it reached the lamina of the vertebral arch. Owing to its trajectory, through the right hemi-thorax from the front and from right to left, we can deduce that it would have caused massive haemorrhaging in the thorax cavity because of which the individual would have soon died. The aorta or other equally important vessels would probably have been affected, as well as the left lung (Figure 15.18). The individual is a young adult male.
- *Case 8 (SJAPL 786).* The arrowhead was located in the medial region of the diaphysis of the right radius, surrounded by a dense new growth of tissue such that it was impossible to remove it. In fact, the point went right through the bone perpendicularly until

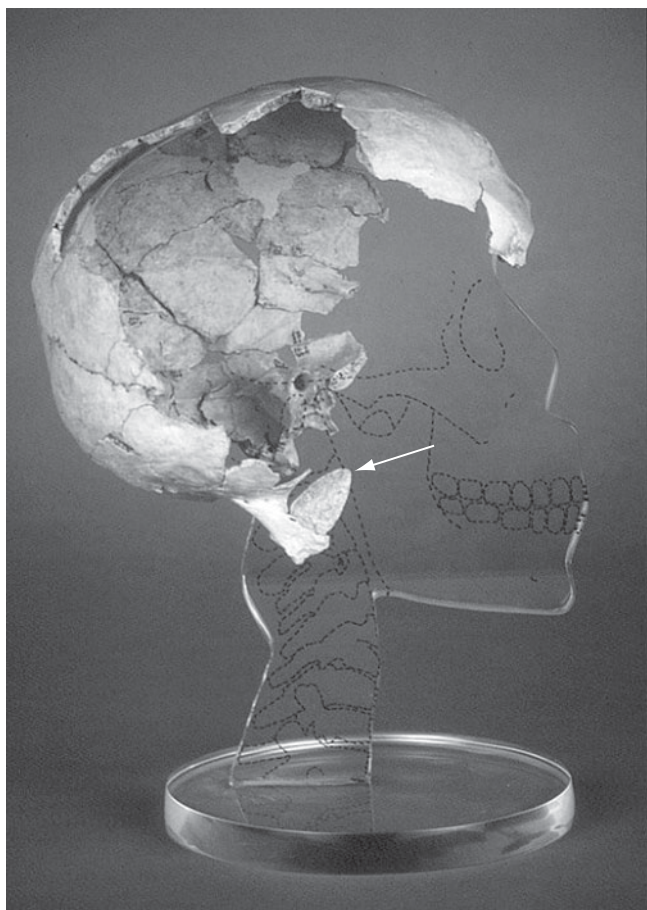


Figure 15.17. Case 6: Skull with the arrowhead encased within new bony growth in the nape region.

it touched the ulna, to which it became fused because of the major healing response (Figure 15.19). While the individual would have been unable to move his forearm fully, the hand would have maintained full functionality as the fusion of both bones occurred in pronation. The individual is a mature adult male.

- *Case 9 (SJAPL 636).* This is a fragment of the vertebral arch belonging to an upper thoracic vertebra, barely represented by the lamina with part of the spinous process and right transverse



Figure 15.18. Case 7: Arrowhead encased in the spinal column.

process. The medial zone has a cavity clearly adapted to the arrowhead fragment lodged inside it, which is only 4 mm wide. The signs of reconstruction though healing or reaction to the 'foreign body' are clear, and have even caused osteolysis around the wound in the lower edge of the lamina. This individual is adult, but of undetermined sex.

- *Case 10 (SJAPL 326).* Fragment of the left hip bone belonging to a young adult male with a round hole, with a maximum diameter of 8 mm, over the greater sciatic notch and in the external face of the bone. Its macroscopic appearance resembles a cystic cavity with an additional depth of about 10 mm (Figure 15.20). A flint arrowhead was found in the proximity of this wound, which has clear signs of remodelling during healing. The trajectory of the impact would have been from behind, over the left gluteus region. It is interesting to note that this same individual also suffered a traumatic dislocation of the right shoulder.
- *Case 11 (SJAPL C122).* This is represented by a partially preserved skull with a cavity 6.4 mm in diameter situated in the medial frontal region, with a depth of 3 mm, and bone

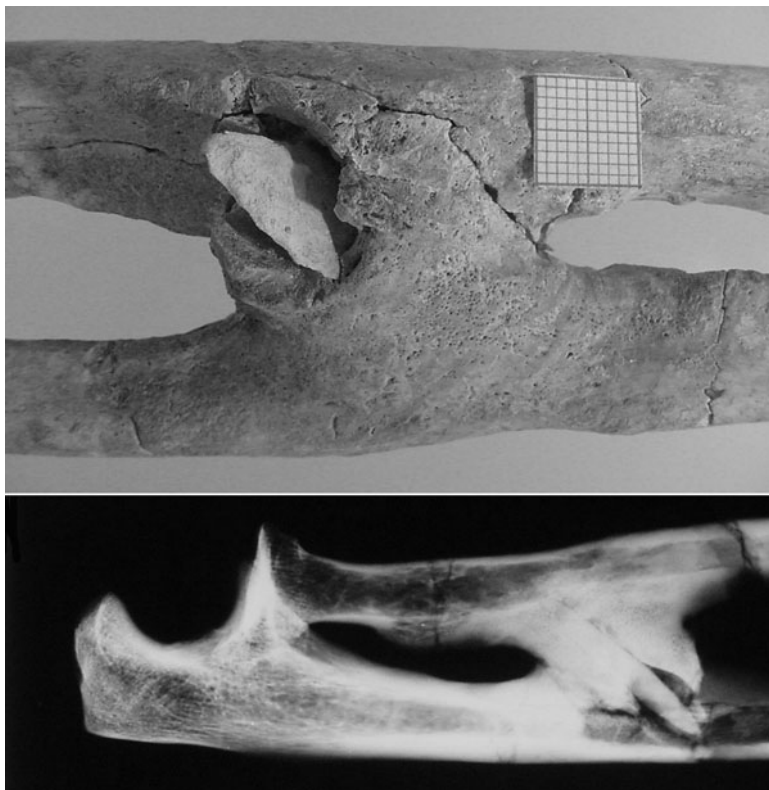


Figure 15.19. Case 8: Forearm bones welded together by new bony growth around an arrowhead lodged in them.

reconstruction around the edges because of healing. At the periphery of the wound, a circle of new growth of the external tissue extends to a maximum diameter of 9 mm. No arrowhead or fragment was found in the wound, but because of the small size of the hole we believe it was caused by a pointed implement and was not a trepanation. The individual was a subadult.

- *Case 12 (SJAPL 325).* The proximal end of a left rib 66 mm long, with a double growth of the cortex of uncertain origin displayed in its internal face. The lower edge has a foramen 5 mm in diameter whose trajectory, rising obliquely and parallel to the lamina of the bone, is shown by a very small hole in the internal face next to the upper edge. The fragment shows

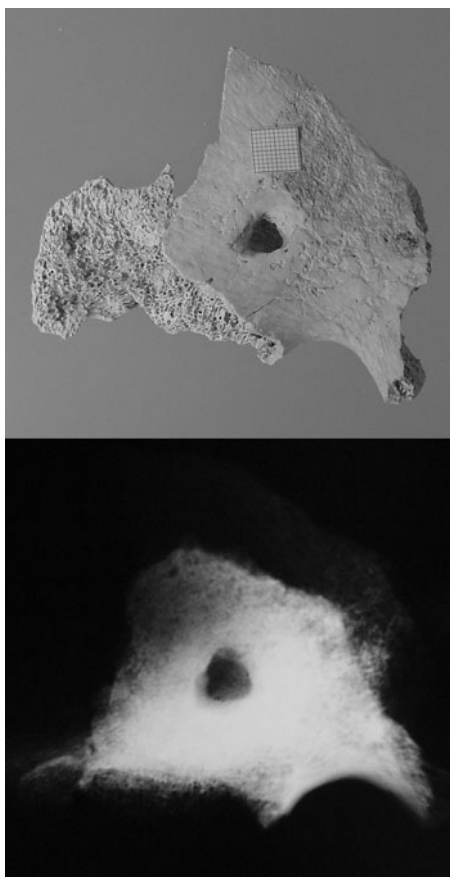


Figure 15.20. Case 10: Hip bone fragment with an arrow wound (very similar to case 1).

new growth and is of the conical and flat type. If it is a direct arrow wound, this would have penetrated from left to right and from above downwards in the middle part of the back, penetrating through the muscle groups of the vertebral channels with direct tangential contact with the ribs. This individual is an adult male.

- *Case 13 (SJAPL 871).* This is the diaphysis of a femur belonging to a subadult with generalized widening of its distal third and irregular alterations to the bone cortex resulting in greater fragility of the bone. In addition, characteristically, it displays a Brodie's abscess 15 mm in diameter located in the posterior side and at the same height as the wound in the diaphysis. The

macroscopic appearance and radiographic image of the spongy tissue suggest a diagnosis in terms of a chronic infection, which could be defined as pyogenic osteomyelitis. In this case, the problem lies in deciding whether it is primary osteomyelitis or haematogenous. The fracture of the bone cortex with the new growth of tissue in the form of exostosis, which is located specifically in an affected part of the bone, seems to be compatible with a lesion, wound, or trauma. The radiographic image does not appear to correspond to a fracture, and therefore it is possible that infection was caused by an injury that developed a primary osteomyelitis because of an arrow wound (i.e. a soft tissue injury).

From the series of evidence of arrow wounds, at least a proportion of individuals found at SJAPL must have suffered several episodes of aggression throughout their lives. In seven cases, the individuals survived a considerable time. Additionally, one of these displays both a healed wound (SJAPL 786) and another without any signs of healing (SJAPL 675). Another individual has a healed wound in the torso (SJAPL 326) and a dislocated shoulder caused by trauma. Yet another may have two wounds, both in the thorax, with no signs of healing.

Other important observations are that most of the cases affect adult male individuals and that wounds in the posterior part of the body predominate (Table 15.3). Together with the above cases, which we

Table 15.3. Age/sex and anatomical location of the arrow injuries

Reference	Age	Sex	Anatomic location
SJAPL 36 (bone)	Adult	–	Trunk (hip)
SJAPL 99 (bone)	Young adult	Male	Trunk (spine)
SJAPL 154 (bone)	Mature adult	Male	Trunk (hip)
SJAPL 170 (bone)	Juvenile	Male	Trunk (chest)
SJAPL 199 (bone)	Juvenile	Male	Trunk (chest)
SJAPL 123 (bone)	Young adult	Male	Head
SJAPL 343 (bone)	Young adult	Male	Trunk (chest)
SJAPL 786 (bone)	Mature Adult	Male	Upper extremity (forearm)
SJAPL 636 (bone)	Adult	–	Trunk (spine)
SJAPL 326 (bone)	Young adult	Male	Trunk (hip)
SJAPL C 122 (bone)	Subadult	–	Head (frontal bone)
SJAPL 325 (bone)	Mature adult	Male	Trunk (chest)
SJAPL 871 (bone)	Subadult	–	Lower extremity (thigh)

believe are clear and indisputable evidence of intentional arrow wounds, others have been observed that might be added to the list, as there are flint points found in contact with or next to bones, although no lesions can be identified in the bone tissue. In fact, it would not be surprising if cases where arrowheads did not become lodged in bones were more numerous, with the projectiles lodged in the soft part of the bodies (i.e. muscle and viscera). Therefore, the long list of examples of violence-related injuries that have been recognized in this collective burial allows us to make the reasonable claim that all arrowheads found together with the skeletons were probably lodged in soft parts of the body and were thus buried inside the cadavers. In this way, they have no ritual significance as grave goods.

Other lesions caused by violence

Other types of injuries have been observed that might be attributed to trauma, such as fractures, particularly to the forearm, and cranial depressions. Regarding the fractures, five healed fractures of perfectly consolidated right ulnae have been described. These are typical of parry fractures that occur when the forearm is raised in defence against an attack. This type of break is relatively common at Neolithic and Bronze Age sites.

As regards cranial depressions and areas of bony reaction, these are probably the result of minor head trauma, which injured the soft tissue and affected the periosteum. Some 8% of the 338 skulls display this kind of bone defect, which is a considerable proportion (Figure 15.21). The injuries are mostly located on the frontal bone and both parietal bones, with a predominance of the right side (Figure 15.22). All ages are represented. Where sexing is possible, predominantly males are affected (Table 15.4).

Other palaeopathological aspects

Four cases of trepanation have been recognized at SJAPL. Signs of survival can be seen in three of them, indicated by growth of new bone around the opening. In fact, the individuals would have survived the 'operation' for a reasonably long time, which we estimate as several months up to over a year. Among these four cases, the three usual trepanning methods are represented, which are traditionally described as abrasion or scraping, drilling, and incision.

The first example is an isolated frontal bone belonging to a juvenile individual. It has a round defect about 23 mm in diameter, located

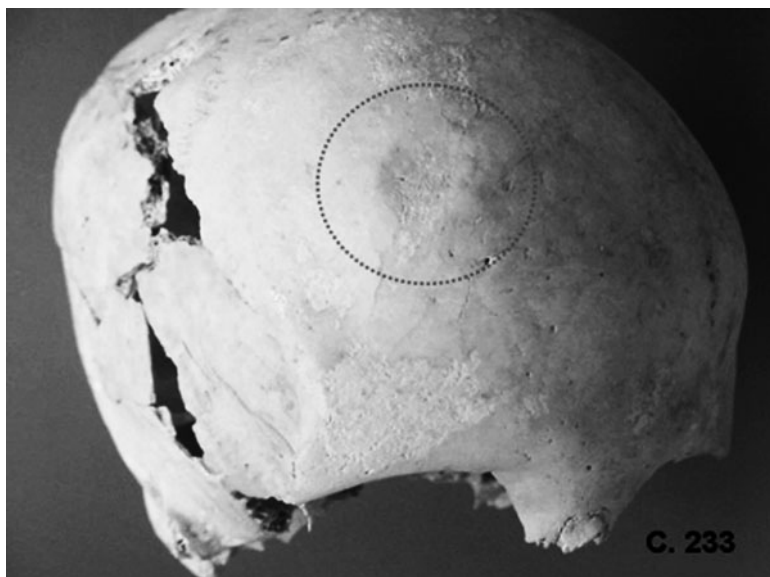


Figure 15.21. Cranial defect on the right side of the frontal bone. Young adult male individual (C.233).

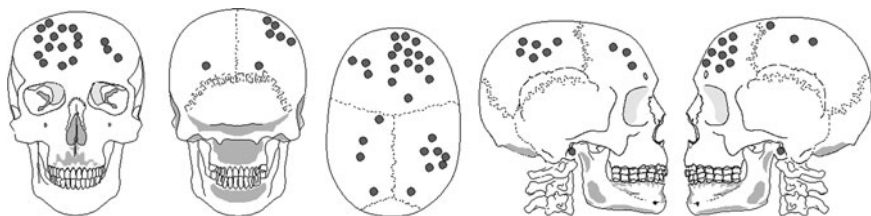


Figure 15.22. Topographic location of the skull lesions observed in several individuals.

immediately to the right of the frontal medial line and centred over a flake of the same bone. The whole edge of the lesion has been finely thinned through the connection between the outer and inner tables, with no evidence of the trabecular tissue of the diploe. On the upper left side of the lesion, bone tissue is characterized by thin spicules. This is clear evidence of osteogenic activity or healing growth, which means the individual survived for a prolonged period. The hole was made by scraping and abrading the bone, which causes a greater loss of matter to the outer table (Figure 15.23).

Table 15.4. Age/sex and location of the cranial defects

Case	Age	Sex	Location	Dimensions
C.12–14 (A1)	Senile adult	Male	Frontal bone	19 × 8 mm
C.015 (B1)	Mature adult	Male	Both parietal bones and frontal bone	Various
C.107	Young adult	Male	Left parietal	13 × 10 mm
C. 111	Young adult	Male	Left parietal	12 × 8 mm
C.122b	Infant II	Male	Middle frontal bone	1 × 1.5 mm
C. 129	Infant I		Middle frontal bone	Circular, 13 × 14 mm
C.141b	Subadult	Male	Right side of frontal bone	Oval, 13 × 9 mm
C.153	Mature adult	Male	Frontal bone	Oval, 9 × 5 mm
C.162	Juvenile	Male	Right parietal	Semi-rectangular, 7 × 14 mm
C.166	Young adult	Male	Right parietal	Circular, 7 × 8 mm
C.171	Mature adult	Male	Left side of frontal bone	Circular, 8 mm
C.178				
C.188	Juvenile	Male	Left side of frontal bone	Oval, 12 × 6 mm
C.190	Infant II	Male	Right side of frontal bone	Oval, 16 × 6 mm
C. 212	Young adult	Male	Left parietal	Oval depression
C. 233	Young adult	Male	Right side of frontal bone	10 × 0.5 mm
C. 240	Young adult	Female	Right parietal	Circular, 6 mm
C.261b	Young adult	Male	Three in the right parietal	Circular and oval
C. 270	Young adult	Male	Right side of frontal bone	Circular, 1 mm
C. 281				
C. 304	Mature adult	Male	Left side of frontal bone	Oval
C.314	Infant I		Middle of the frontal bone	Circular
No label	Infant II	–	Middle of the frontal bone	Punctate
SJAPL-Z	Adult	–	Frontal bone	Rounded, 10 mm

A trepanation, performed with the drilling technique, has also been identified on a fragment of left parietal bone. The edges display new growth because of osteogenic processes, indicating the individual survived after the operation. The third case is a parietal fragment cut with the incision method. A fourth case, possibly also by drilling, is an incomplete trepanation of the right parietal of a young adult male.

As well as the lesions caused by trauma, the neoplastic lesions shown by two male individuals are of interest. In one case, the hip bones and lower limbs of a male display osteolytic lesions with disorganization of the spongy tissue and destructuring of the trabeculae. Differential diagnosis includes metastasis of a possible soft tissue carcinoma, possibly located in the prostate or lung, as well as Ewing's sarcoma.

The skull of another juvenile individual displays small perforations with the complete destruction of cortical tissue in both the external and internal surface; the holes have the appearance of having been made with a punch (Figure 15.24).



Figure 15.23. Trepanning by the scraping technique. Note the reconstructed edges and spicules indicating the individual survived the operation.

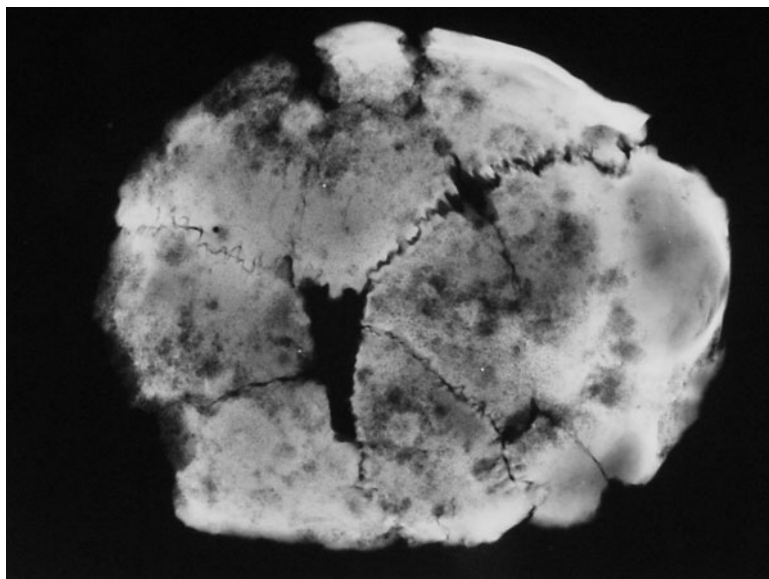


Figure 15.24. Radiograph showing the rarefaction of the cranial bones of a juvenile individual: osteolytic images of neoplastic appearance.

To all of the above can be added a number of pathological signs related to degenerative changes, both to the vertebra column and to the joints, as well as in relation with odontology.

DISCUSSION AND CONCLUSIONS

SJAPL is a rock shelter used as a collective burial place at the end of the fourth millennium BC. From an archaeological point of view, the burials, corresponding to over 300 individuals, were accumulated in a single level with no divisions. The decomposition of cadavers, which were deposited in a certain way, occurred within a filled space. Their superimposition and pressure on those situated below impeded the disarticulation and post-depositional movement of the skeletons during the decomposition process. However, good conservation of the anatomical connections can only be explained if the place was originally closed off in some way. The collapse of the natural roof, almost certainly not long after the burials, ensured preservation of the remains until the present time, although not completely, which affects our interpretation of the site.

All age groups are present in the buried population. However, the proportion of individuals who had not reached maturity (60%) is highly significant. It is a young population, with a low life expectancy of only 20 years at birth. The predominance of males among the sexed individuals is clear: two-thirds of the population are males and the remaining third females. This demographic profile does not match the normally accepted characteristic of archaic populations.

The anthropological collection is also outstanding for the numerous signs of lesions caused by trauma: fractures, skull erosion and, above all, flint arrowhead wounds. These are, without doubt, the most significant aspect of the site and need to be discussed further.

We believe, as stated above, that, as well as the 13 cases defined as certain violence-related injuries, there were as many as 61 wounds, corresponding with the number of arrowheads found in deposits. In these other cases, the arrows would have impacted on soft parts of the body only, without affecting any bones. Some of the arrowheads stayed inside the individual for some time, lodged as foreign bodies. On other occasions, the injuries show no signs of

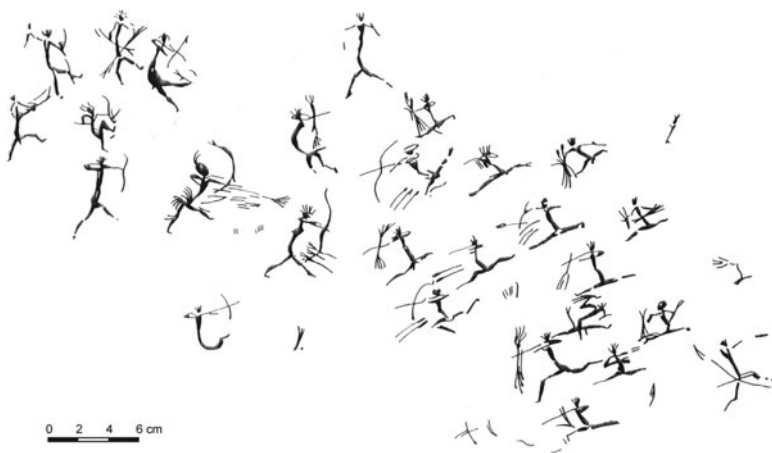


Figure 15.25. Archers fighting. Painting from the rock-shelter at Les Dogues, Castellón (following J.B. Porcar).

regrowth of the bone, which implies they may have been the cause of death, and are of a violent aetiology. The existence of healed wounds and others without signs of remodelling in the same individual shows that some people suffered several episodes of aggression during their lives.

Therefore, arrow wounds at SJAPL are evidence of a series of violent episodes in which individuals buried there took part. At the same time, they show the considerable development of archery during the fourth and third millennia BC. The substitution of geometric microliths by true arrowheads, manufactured with perfect mastery using the technique of flat retouching, a method forgotten for many millennia, could have been an influence, given the improved aerodynamics and penetrating power of the new projectiles. SJAPL, together with other sites that are now known, including certain depictions in the so-called Levantine Art of the Spanish Mediterranean regions (Figure 15.25), shows that, for societies at the time, the bow was not only a hunting instrument but used quite frequently as a very effective weapon in the resolution of intra- or intergroup conflicts by violent means.

Thus, in southwest Europe, several forms of evidence of this practice have been found, especially for the Late Neolithic and the Chalcolithic (Guilaine and Zammit 2001). Surprisingly, this evidence

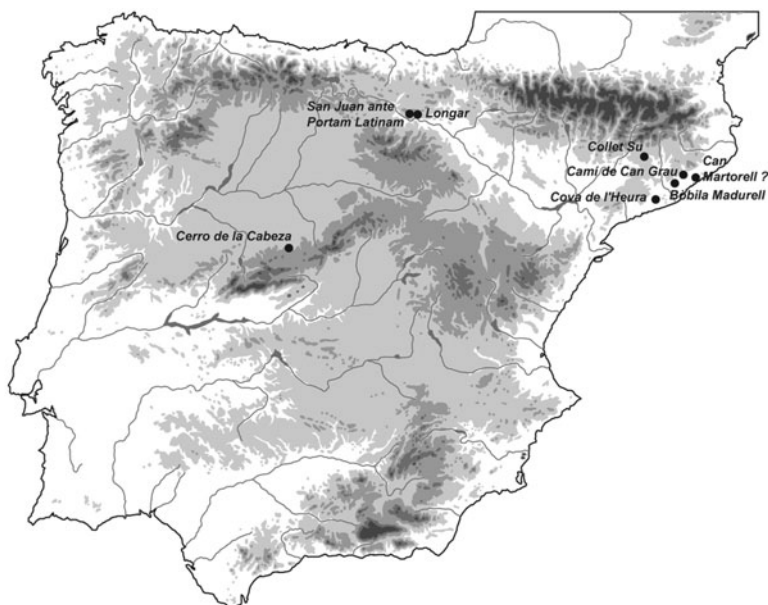


Figure 15.26. Sites in the Iberian Peninsula where arrow wounds attributed to the Neolithic and Chalcolithic have been documented.

appears to be concentrated above all in the Mediterranean region, particularly in the French Midi, where collective burials in caves, hypogeal, and megalithic tombs are very abundant. Some of these burials show great similarity with SJAPL as to funerary rites, material culture, and signs of violence (Beyneix 2003; also see Chapter 12, this volume).

In the Iberian Peninsula, much less evidence of this type is known, but it has increased in recent years, and is equally concentrated in the Mediterranean region, including the Ebro Valley (Etxeberria *et al.* 1995) (Figure 15.26). Among these sites, the recent find and excavation of the collective Chalcolithic burial at La Costa de can Martorell (Barcelona) can be cited. Although no arrowheads clearly lodged in human bones (corresponding to about 200 individuals) have been found, the analysis of impact fractures on the projectiles, presence of violent injuries more generally, and other factors suggest that burials took place there as the consequence of an episode of violence (Mercadal 2003).



Figure 15.27. Four cases of arrow wounds from the hypogeum at Longar, Navarra (following J. Armendariz and S. Irigaray).

However, because of its extraordinary parallelism with SJAPL, we should particularly mention the hypogeum at Longar (Navarre). Located only 10 km to the east of SJAPL, it is also an atypical funerary structure in the region. The tomb consists of a corridor and a perforated stone door giving access to a semi-underground chamber with stone walls, covered by a large monolithic slab. In the course of its excavation, the remains of over 100 individuals were found, together with flint arrowheads similar to those at SJAPL, that were in four cases also lodged in the bones (Figure 15.27). The radiocarbon determinations obtained for this tomb are practically identical to those at SJAPL (Armendariz *et al.* 1994; Armendariz and Irigaray 1995).

The anomalous circumstances found at SJAPL raises the question of whether or not the burials were simultaneous. Although it is not possible to confirm that all individuals were buried at the same time, it is clear that this is at least the case for many of them. In any event, the use of burial space must have had a short duration, as is shown by the aspect of the burials, typological homogeneity of the objects accompanying them, and radiocarbon dates.

If the premise that it is a quasi-simultaneous funerary deposit is accepted, other equally important questions are posed. The burial of

over 300 individuals in a short space of time (to which may be added another 100 individuals from the nearby and contemporary site at Longar) means that a large community must have existed in the area, whether or not the population buried at SJAPL was a reflection of the natural population. The possibility of imagining such a large group goes against the ideas that have been accepted until now for this prehistoric period, in this particular geographical area.

The choice of burial place, which is uncommon if it is compared with other necropoli in the area, could be explained by the simultaneous death of many of the individuals buried there. In fact, the first cadavers deposited in direct contact with the surface of the rock-shelter floor have arrow wounds, and flint arrowheads are more numerous in this first layer of burials. It is quite possible that the place chosen for burials is related to the need to bury several individuals who had been killed violently at the same time. If the explanation given above is accepted as correct, the later use of the whole shelter may have had an equivalent reason, related to the crisis that must have happened.

In conclusion, SJAPL could be considered an atypical collective burial, where originally several individuals who had died violently were buried. Later, others belonging to the same human group, affected by a demographic crisis, were buried in the same place. This crisis would have developed in a more or less short period, and be characterized by a high death rate or a sudden increase in rate. In prehistoric times, and particularly in historical periods, these demographic crises have been attributed to three causal agents: famine, war, and epidemics, factors which in the end are inter-related.

Following the theoretical discourse formulated by several researchers, violence and intergroup conflicts are caused, in general, by competition for control of economic resources, of which specific evidence exists from the Neolithic onwards, when the means of production were developed. In this way, the SJAPL site constitutes a significant example, reasonably supporting the hypothesis of conflicts in the region. Its location should be taken into account as a reason for such conflicts, in that it is in the drainage basin of the River Ebro, a fertile area benefiting from the Mediterranean climate, and near the Sierra de Cantabria, where the climate becomes more oceanic, and therefore, provides access to a range of different natural resources.

ACKNOWLEDGEMENTS

This chapter includes information provided by other researchers who have equally contributed to the study of the site: J. Ajamil (Surveying and Plans); J. Altuna and K. Mariezkurrena (Macro-mammal Archaeozoology); P. Areso and A. Uriz (Sedimentology); M. Elorza (Bird Archaeozoology); M.J. Iriarte (Palynology); B. Márquez (Lithic Use-Wear Analysis); L.M. Martínez Torres (Geology); E. Pemán (Micro-mammal Archaeozoology); and C. de la Rúa (Anthropology).

Evidence of traumatic skeletal injuries in the collective burial caves of the Nabão Valley, central Portugal

Luiz Oosterbeek and Tiago Tomé

INTRODUCTION

Excavated between 1983 and 1994, a set of three caves containing collective burial contexts from the sixth to the third millennia cal BC in the Nabão Valley (central Portugal) was recently reassessed using a palaeobiological approach. This assessment allowed us to achieve a clearer image of both the individuals buried there and the communities to which they belonged. Besides briefly presenting the data gathered in the course of this research, we focus on the traumatic skeletal injuries recorded in these samples, their characteristics, location, and demographic incidence, to raise questions about the nature of the processes leading to their presence within the osteological record of these burial sites.

GEOGRAPHIC SETTING AND PREVIOUS RESEARCH ON THE REGION

The North Ribatejo is a composite region defined as the crossing of three distinct geomorphological units: (1) Ancient Massif to the east (schists, granites, gneisses); (2) Estremadura Limestone Massif to the west; and (3) Tagus Basin (detritic deposits) to the south (Cruz and

Oosterbeek 1998; Oosterbeek *et al.* 2001). A tributary to the Tagus Basin, the Nabão River runs along a 60-km geomorphological corridor, defined across the eastern area of the Limestone Massif, in a generally north–south direction (Zilhão 1992; Oosterbeek 1994). This general orientation is abruptly disturbed in the ‘Canteirões do Nabão’, a short, very steep valley north of Tomar, where a sturdier karstic landscape forces the river to several short changes in its direction towards the east for roughly 600 m (Cruz 1997; Oosterbeek 2007). The strong influence of well-developed karstic processes in this corridor allows for an abundance of cavities and rock shelters, some of them bearing signs of human use, namely as burial sites (Zilhão 1992; Cruz 1997; Oosterbeek 2007).

Prehistoric research in this region of central Portugal has been developing over the last 25 years. The number of sites identified, surveyed, and excavated allows the construction of models for the human occupation of this region, with a special focus on Holocene settings (Oosterbeek 1994; Cruz 1997). Among these, funerary contexts have been extensively studied, including a cluster of burial caves located in the area mentioned above, approximately 10 km north of Tomar (Figure 16.1). Burials studied in the present chapter focuses on three of these burial caves: Gruta dos Ossos (GRO), Gruta do Cadaval (CDV), and Gruta de Nossa Senhora das Lapas (GSL), all three excavated by Luiz Oosterbeek and Ana Rosa Cruz, between 1983 and 1994 (Oosterbeek 1985, 1993a,b; Oosterbeek and Cruz 1991; Cruz 1997).

Research conducted in the region has suggested the existence of two main cultural traditions: one to the west, expressed in the cave burials studied in this chapter, and another to the east and south, expressed in megalithic burials. One of the authors (Oosterbeek 1994) has suggested that the former stands for a continuum after first contact with Mediterranean groups integrated in a ‘Cardial Ware network’, whereas the latter would build on interactions with the Mediterranean world arriving to the region from the interior (Oosterbeek 2007). Despite the lack of human bones in the eastern area, the study of cave burials is crucial for characterizing the context and interpretation of the related society and economy. Further studies on skeletal material excavated to the east (in Spain) will allow for broader comparison.



Figure 16.1. Location of Tomar on the Iberian Peninsula. Bottom-right detail: excerpt from the Portuguese Military Map 1:25 000, sheet 310, showing the location of the three caves: (A) Gruta dos Ossos; (B) Gruta de Nossa Senhora das Lapas; (C) Cadaval.

CHRONO-CULTURAL FRAMEWORK

Absolute datings were carried out on human remains from all three caves, as a follow-up to fieldwork. The results indicate use of these caves for burial purposes between the late sixth and the third millennia cal BC (Table 16.1).

Table 16.1. Absolute datings for the three caves considered in this chapter

Site	Method	Reference	Origin	Date BP	cal BC 2σ
GRO	Radiocarbon	ICEN-465	Homo? (Layer 1–3)	4630 $\pm$ 80	3628–3100
GRO	Radiocarbon	I-17368	Homo? (Layer 1–3)	4460 $\pm$ 110	3400–2880
GRO	Radiocarbon	I-17248	Homo? (Layer 4)	3970 $\pm$ 140	2954–2217
GRO	AMS	Beta 189996	Metacarpal	4330 $\pm$ 40	3020–2890
CDV	Radiocarbon	I-17241	Layer C	5180 $\pm$ 140	4354–3732
CDV	Radiocarbon	ICEN-803	Layer D	5390 $\pm$ 50	4350–4045
CDV	Radiocarbon	ICEN-464	Layer D	5160 $\pm$ 50	4212–3817
GSL	Radiocarbon	ICEN-802	Layer B (Base)	6100 $\pm$ 70	5230–4847
GSL	Radiocarbon	I-17247	Layer B	5130 $\pm$ 140	4290–3672

Bearing these chronological data in mind, analysis of these three contexts allows the building of a chrono-cultural sequence, attempting to correlate the several horizons recorded with the funerary practices adopted and material culture left behind by these communities, accompanying their deceased members. These burial caves seem to have been used by communities stemming from a Cardial tradition, with lithic implements revealing a prevalent association with knapped flint and polished amphibolite tools. Pottery recovered in these sites reveals a tendency for large vessels, with decoration patterns changing along the sequence, including impressed, incised/impressed, and grooved ware (Oosterbeek 2007). By the end of the sequence, Beaker Ware is recorded, although in a context from which no reliable absolute datings are available. Nevertheless, the presence of such pottery, associated with a sub-trapezoid copper axe found within the burial context of Nossa Senhora das Lapas (Layer A), allows for an Early Bronze Age attribution for this layer (Oosterbeek 1993b). A clearer image of the diachronic correlations within this cluster of burial caves may be achieved with the combination of several aspects, such as chronology, material culture, and funerary behaviour (Table 16.2).

HUMAN SKELETAL REMAINS

Human skeletal remains, the central focus of activity at the caves, have been the subject of detailed laboratory analyses since the first stages of post-excavation work (Oosterbeek and Cruz 1991). Nevertheless, these remains were recently re-analysed in systematic palaeobiological assessments by *Silvia Lopes* and *Tiago Tomé* (Lopes 2006; Tomé 2006). The caves are now being integrated in a larger comparative study. In general, Gruta dos Ossos seems to be the best-preserved sample. From the analysis, all three samples add up to 2471 bones and 437 teeth. We include here a brief presentation of the data collected in these reassessments.

Composition of the sample: minimum number of individuals and demography

All samples were assessed in terms of the minimum number of individuals (MNI) present. The results indicate that these were small necropoli, as none includes a total of individuals above 30

Table 16.2. Chrono-cultural frame for the several burial caves mentioned, with absolute datings, material culture, and funerary rituals combined

Site	Cultural stage	Absolute date cal BC 2σ	Type of burial	Lithic industry (raw materials)	Lithic industry (types)	Ceramic decorations
GSL (Layer B)	Early Neolithic	5230–4847	Individual	Prevalence of knapped flint, polished am- phibolite tools	End-scrapers, burins, points, blades, bladelets, occasional macrolithic cores	Impressed
CDV (Layer D)	Middle Neolithic	4350–4045; 4212–3817	Individual		Trapezes, blades, bladelets, burins, scrapers, polished stone	Incised and Impressed
CDV (Layer C)		4354–3732	Collective		Points, blades, notches, bladelets, burins, microliths, scrapers, polished stone, occasional macrolithic cores	Grooved ware
GRO	Late Neolithic	3628–3100; 3400–2880; 2954–2217; 3020–2890	Collective		Points, blades, notches, bladelets, burins, microliths, scrapers, polished stone, occasional macrolithic cores	Grooved ware
GSL (Layer A)	Early Bronze Age	N/D	Individual		Disturbed context - no reliable cor- relations with lithic tools. Associated with a flat, sub-trapezoid copper-axe	Beaker

(Gruta dos Ossos: 19 adults, seven subadults; Gruta do Cadaval: 17 adults, eight subadults; Gruta de Nossa Senhora das Lapas: five adults, four subadults).

Demographically, these samples were assessed through determination of sex and estimation of age at death. In general, the results were balanced for both aspects, although the poor preservation of samples forced us to use methodologies for assigning sex based on lesser dimorphic features of the human skeleton, such as the calcaneus, talus, and humerus (Silva 1995; Wasterlain and Cunha 2000). Whenever possible, the more sexually dimorphic elements, such as the cranium, have been assessed (Lopes 2006; Tomé 2006). We recorded males and females, as well as infants, children, adolescents, young adults, and adults. There are a few possible cases of elderly individuals, although we are still cautious of conclusively assigning them to that age group (Figures 16.2 and 16.3).

Morphology

Whenever the preservation of the samples permitted, a morphological assessment was carried out. The few results obtained indicate the presence of at least two robust males and one robust female in Gruta dos Ossos, a gracile female in Gruta do Cadaval, and a gracile individual of unknown sex in Gruta de Nossa Senhora das Lapas.

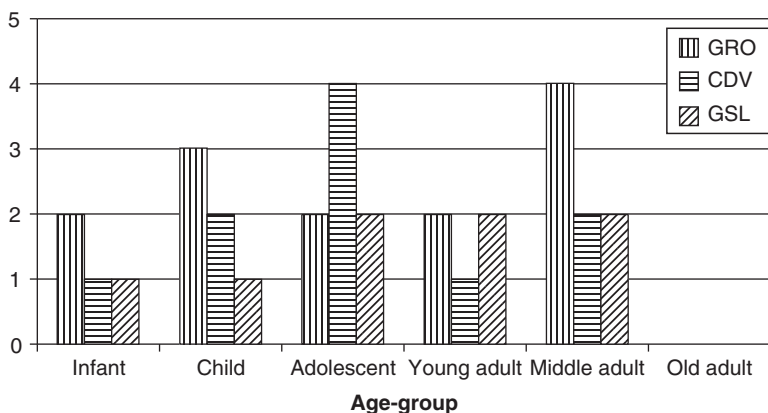


Figure 16.2. Age-at-death estimates for all three samples analysed, distributed according to the age categories defined by Buikstra and Ubelaker (1994).

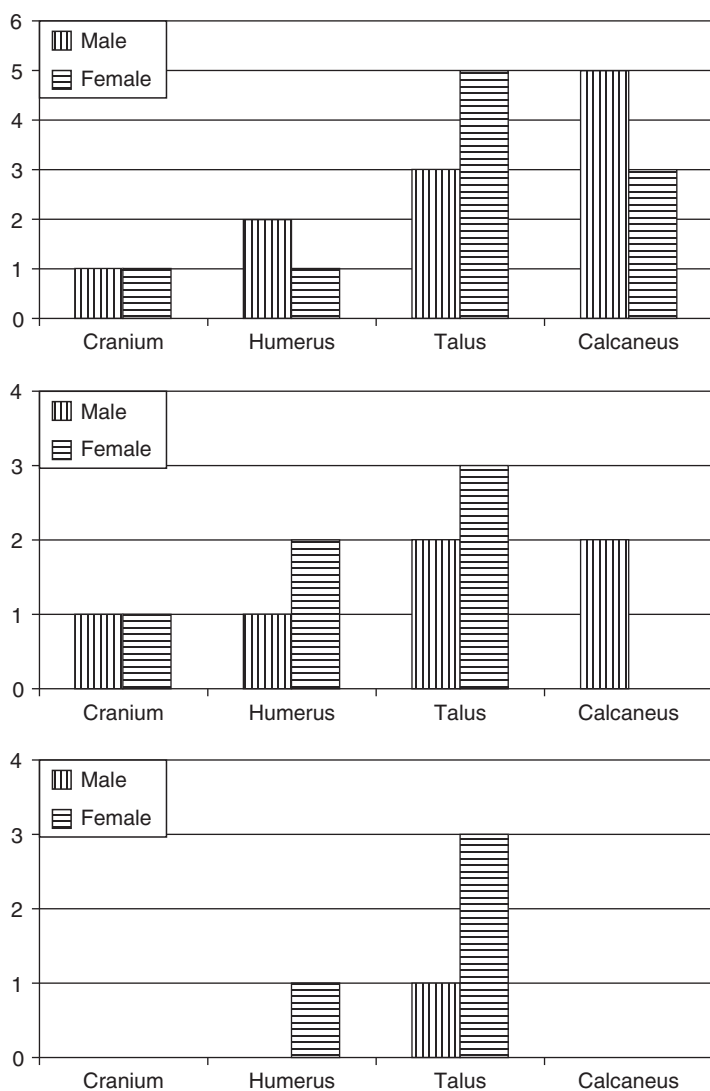


Figure 16.3. Sex diagnosis results by skeletal element. Top: Gruta dos Ossos. Middle: Gruta de Nossa Senhora das Lapas. Bottom: Gruta do Cadaval.

Regarding stature, the results show several individuals measuring over 170 cm. In addition, there seems to be a high amplitude in the estimates (about 30 cm), which might be amplified by the high sexual dimorphism recorded on stature (Lopes 2006; Tomé 2006).

Palaeopathological assessment

The recording of pathological traits on these samples was severely limited by their poor preservation. However, some conditions could be analysed and recorded. The palaeopathological analysis of human remains from Gruta dos Ossos is the widest of the three samples, including oral, traumatic, degenerative, infectious, and neoplastic lesions. As for Cadaval and Nossa Senhora das Lapas, the high fragmentation rate of these samples limited our pathological assessment.

TRAUMATIC SKELETAL INJURIES: DESCRIPTION AND DEMOGRAPHIC DISTRIBUTION

A total of nine trauma-related lesions were identified on human remains from Gruta dos Ossos (eight) and Gruta de Nossa Senhora das Lapas (one). Seven of these were located on cranial elements, with all showing signs of remodelling related to the healing process. There seem to be no peri-mortem traumatic injuries in any of the three samples. The cranial lesions recorded are briefly described in Table 16.3.

Table 16.3. Description of cranial traumatic lesions recorded on Gruta dos Ossos and Gruta de Nossa Senhora das Lapas

Specimen	Sex	Age-group	Affected bone	Siding	Lesion shape	Diameter		Remodelling of bone
						Max. (mm)	Min. (mm)	
GRO 8VI 4	M	45–60	Parietal	Left	Circular	33	30	Yes
GRO 9V SC1	?	Adult	Parietal	Right	Circular	14	11	Yes
GRO 8VI 2	M	40–50	Frontal	X	Oval	25	11	Yes
			Parietal	Right	Circular	24	24	Yes
GRO 9VII 53	M	<40	Occipital	X	Circular	21	18	Yes
GRO 9VI 235	M	Adult	Parietal	Right	Oval	22	10	Yes
GSL SC1	M	Adult	Parietal	Left	Oval	31	15	Yes

The distinction between violent and non-violent traumatic injuries has been the focus of previous research in several contexts (Wakely 1997). Although a correct interpretation of the causes of such features is not a simple matter, some general trends were described. High trauma frequency in post-cranial elements, with both genders and all age groups affected, probably reflects mainly accidental injuries (Lovejoy and Heiple 1981), while high frequencies of cranial trauma, especially on male individuals, have been suggested to reflect a violent origin (Roberts and Manchester 2005). However, one should consider the uncertainty of such general suppositions when applied to specific communities, particularly those from the past. Bearing these issues in mind, we tried to analyse our data to try to identify any trends in our samples. As we have seen, traumatic injury is located mainly on cranial elements, with parietal lesions being predominant (on both the left and right sides). Most of the lesions are located posteriorly, all of them showing signs of healing (Figures 16.4–16.6). As for the demographic distribution, lesions seem to occur only on adult individuals. On the other hand, a reliable comparison between cranial injury and sex is hampered, as sex diagnosis of cranial elements was inconclusive for most of the individuals represented, namely when we compare the sexually diagnosed individuals with the total number of



Figure 16.4. Skull belonging to an individual of unknown sex from Gruta dos Ossos, presenting a traumatic lesion on the right parietal.

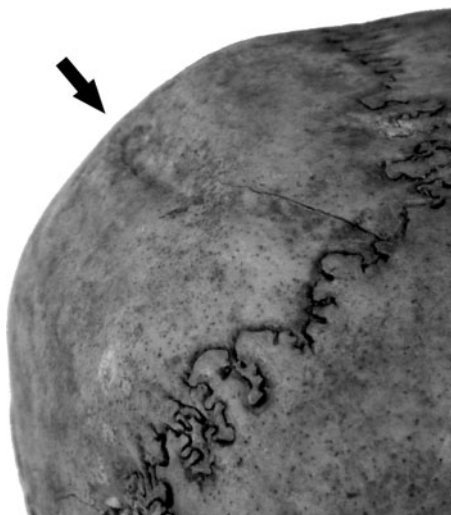
individuals present in each cave. Regarding the Gruta dos Ossos sample, one can state that four male and one unknown sex individuals identified, presented healed blunt force depressed fractures, while the only definite female individual did not show any signs of cranial injury.

The evidence is not conclusive. The absence of major trauma in subadults and on the only undisputed female might moderately suggest a violent cause, as traditional views would favour a more

Figure 16.5. Skull of a male individual recovered from Gruta dos Ossos, with a traumatic lesion on the occipital.



Figure 16.6. Detail of the lesion on the left parietal of a male individual recovered at Gruta de Nossa Senhora das Lapas.



common engagement of adult males in conflict episodes. However, there is still no definitive evidence of this, and other activities might well propitiate similar effects.

Preservation issues

The data presented above are the result of our most recent assessment of these samples. Nevertheless, we are aware of the existence of sample preservation and context disturbance issues limiting our approach and do not wish to neglect them. Indeed, beyond the inherent issues that might arise from our own approach, a few extrinsic factors have been identified that might help to explain the seemingly fragmentary image these sites show nowadays.

One must bear in mind, for instance, the notion that such high fragmentation rates of skeletal remains might in fact be masking the real frequencies of traumatic injuries on the communities who used these burial sites. If so, the apparent absence of traumatic injuries at Gruta do Cadaval might reflect the very poor preservation of cranial elements recovered from this cave.

In addition, the location of these caves, near to ancient trails used by local populations, probably played a major role in their preservation status. The case of Gruta do Cadaval is in many respects exemplary, as this cave was used for stocking cattle up until a few decades ago, according to the local population, although clear signs of trampling damage are not identifiable on these human remains. In the case of Gruta de Nossa Senhora das Lapas, the uppermost layer was extremely disturbed (Oosterbeek 1993b). Finally, Gruta dos Ossos showed clear signs of disturbance, with probable non-scientific recovery of human remains, before 1982. Thus, one should handle the available data quite carefully, as post-depositional processes seem to have been very important in all the three caves analysed.

When comparing the number of individuals affected with the number of reasonably well-preserved crania recovered from these caves, one may have a clearer image of the real frequency of cranial traumas. In the case of Gruta dos Ossos, five individuals are affected, of a total of 13 adult and two juvenile crania analysed. Regarding Gruta de Nossa Senhora das Lapas, only two cases were recorded where more than just small cranial fragments were preserved, both belonging to adult individuals (one male and one female). As noted above, the male individual presents a traumatic lesion. Further demonstrating the

above-mentioned high fragmentation, Gruta do Cadaval's sample holds only one well-preserved cranium, belonging to an adult individual.

FINAL REMARKS

Trauma-related skeletal lesions may be the result of several different actions, bearing differing final characteristics; thus, the importance of their analysis for the study of several issues of the human past. The classic view of prehistoric societies as mainly egalitarian and, as such, more peaceful (Hernando 1999, pp.15–60), is challenged by the positive identification of interpersonal violence in European Neolithic human remains. Scenarios range from overwhelming evidence of violent episodes affecting large numbers of individuals such as at Talheim (Price *et al.* 2006; Wahl and Trautman Chapter 5, this volume), in Germany, or San Juan ante Portam Latinam, in Spain (Vegas 2007; Vegas *et al.*, Chapter 15, this volume), to more subtle pieces of evidence, such as arrow wounds or peri-mortem lesions.

Regarding the Iberian Peninsula, some cases of arrow wounds are reported for the Neolithic–Chalcolithic period, in sites such as the above-mentioned San Juan ante Portam Latinam, Hipogeo de Longar, Bóbila Madurell, and Camí de Can Grau (Armendariz *et al.* 1994; Kunst 2000; Etxeberria and Herrasti 2007). The evidence from Portugal is, for the time being, even sparser: one skull lesion is interpreted as possibly being caused by an arrowhead, from the Dolmen de Ansião (Silva 2002a; see also Silva *et al.*, Chapter 17, this volume). As for the Nabão Valley burial caves, the traumatic lesions identified so far have proven inconclusive regarding their nature. As mentioned above, an interpretation related to interpersonal violence is rendered inconclusive by a combination of several aspects, namely the undiagnostic nature of the fragmentation. The lesions, if we consider the steep nature of the surrounding landscape, can be assigned to accidental causes. Moreover, the artefactual assemblages recovered in association to the human bones do not include 'weaponry' (arrowheads are absent, for instance). Some tools (e.g. axes, adzes, blades, etc.) could serve a violent purpose, but unpublished results from ongoing research indicates that, whenever use-wear analysis was carried on some of these their functional use was always associable to daily life economic and domestic activities.

No specific weapons are known for this period in the region, even if arrowheads do exist in the 'megalithic area' to the south. Not a single case of association between a specific injury and a given tool has been identified. Although in various parts of the country, and especially, closer to the Atlantic coastline, several walled enclosures (often designated as hill forts, even if this interpretation has been recurrently challenged) are identified, no similar structures exist in our region. The settlements are located in areas of easy access, with no defensive walling before the third millennium, and again with no evidence of weaponry (Oosterbeek 1994, 1997; Cruz 1997).

Besides the intrinsic factors, such as individual morphological variation, preservation seems to be the key issue in these samples. In any case, the recorded lesions stand, at least, for a stressful behaviour, related either to social tension (violence) or to the harsh conditions of resource procurement. Seemingly important in this issue is the fact that only adult and mainly male individuals seem to show these lesions, thus suggesting that one must consider specific activities excluding the participation of juvenile individuals, for the origin of these cranial lesions and, naturally, violence-related causes cannot, for the time-being, be excluded from our interpretative horizons.

Ongoing studies are aiming at reviewing skeletal collections related to the eastern areas of the Tagus basin, to assess indicators of variability or of convergence with those areas now studied.

ACKNOWLEDGEMENTS

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Skeletal evidence of interpersonal violence from Portuguese Late Neolithic collective burials: an overview

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ABSTRACT

This chapter reviews bone injuries detected from Late Neolithic Portuguese skeletal collections, with a focus on those that may represent cases of interpersonal violence. Forty-three traumatic lesions from 16 Portuguese samples are discussed. Cranial injuries (86%), particularly cranial depressed fractures (70%), were the most frequent traumatic injury found, including the only trauma observed in a subadult individual. In the postcrania, with the exception of an embedded arrowhead in a vertebra (C2), all other injuries were cut marks ($n = 5$). The majority of cranial lesions show signs of healing. The collective burial practices of these prehistoric populations combined with an imbalanced sample size, poor preservation, and incompleteness of the commingled human remains assemblage makes it difficult to interpret the overall importance of possible cases of interpersonal violence within a global perspective of these populations.

INTRODUCTION

During the last decade, research and interest in interpersonal violence has risen considerably in archaeology as well as in anthropology.

Evidence of frequent episodes of large-scale violence in the past is documented by written sources, the presence of weapons (or tools that could have been used as such), depictions of violence, fortifications, and large-scale destruction (Thorpe 2005), or indirectly by ancient written sources referring to more early times. However, evidence based directly on skeletal remains is less common (Walker 1989; Monks 1994; Dawson *et al.* 2003). As in other regions of Europe, interpersonal violence and warfare have been discussed in the Portuguese Neolithic based on evidence of ditched and walled settlements, interpreted by most authors as fortifications, and on possible weapons (Monks 1994, 1997; Oosterbeek 1997; Kunst 2000). This type of interpretation has increased markedly in the last two decades due to several publications, especially from northern and central Europe, where human remains show evidence of trauma likely originating from acts of violence (Guilaine and Zammit 2001; Walker 2001; Schulting and Wysocki 2002, 2005; Gilchrist 2003; Thorpe 2003; Christensen 2004; Wild *et al.* 2004; Jiménez-Brobeil *et al.* 2009, among others). Injuries most frequently associated with interpersonal violence and observable in archaeological skeletal remains include cranial vault and facial injuries attributed to direct blows or punctures, multiple lesions from frequent or severe assaults and distal ulna shaft fractures (Judd 2004; Jurmain *et al.* 2009).

In Portugal, human remains dating generically to the Middle and Late Neolithic period (4000–2500 BC) are mainly known from collective burials such as natural caves, dolmens, rock-cut tombs, and vaulted chamber tombs, but are often fragmented and commingled. These burials represent a set of magical and funerary practices that have been designated as the phenomenon of Megalithism (Sherratt 1995; Gonçalves 2003; Boaventura 2009).

In this work, 54 collective burials, consisting of 16 dolmens, 24 natural caves, nine rock-cut tombs, and five vaulted chamber tombs, have been considered. The minimal number of individuals (MNI) varies between tombs, from less than 10 to more than 400 individuals (Silva 2003d; Boaventura 2009). Moreover, the human remains were recovered with no, or almost no, anatomical connection due to burial practices, post-deposition activities, and excavations utilizing outdated methodologies. To date, among those collections studied, more than 3200 individuals from this period have been estimated, recovered mainly from the region of the *Estremadura* in the west-central part of Portugal (Silva 2002b; Boaventura 2009). This is a

consequence of the better preservation of human remains in this region, due to the geological compositions of limestone and silt, which resulted in less acidic soils. Nevertheless, despite the existence of hundreds of known burials, only a few dozen have been studied. In neighbouring regions, such as the Alentejo and northern parts of Portugal, despite the thousands of dolmens and other types of graves that have been identified and excavated (Leisner and Leisner 1959; Leisner 1965; Senna-Martinez 1989; Jorge 1990; Leisner and Kalb 1998; Cruz 2001), very small amounts of preserved human remains have been revealed. The geological compositions here, predominantly of granite and schist, may explain this unfortunate loss of evidence. However, it is probable that there were many thousands of individuals present.

The systematic study of human remains from these Neolithic communities began in the 1990s, including aspects of funerary anthropology, demography, morphology, and pathology (Silva 1996a,b, 1999, 2002, 2003a–d, 2007; Cunha *et al.* 2007). Trepanation is the most studied lesion. Still, only 22 trepanations performed in 18 individuals are reported for Portuguese Neolithic or Early Bronze Age samples. The two methods used were scraping and incisions. The trepanations were performed above all in male individuals, although some findings belong to individuals of unknown sex. The parietal bone (85%) was the most frequently trepanned skull element followed by the frontal (10%) and temporal (5%) bones. More than half of interventions performed on the parietal bone were on the right side (one covering both sides; nine right; five left; and two unknown). Only one trepanation (Eira Pedrinha, see below) was linked with a previous traumatic event (for a survey of Portuguese trepanation, see Silva 2003c).

Recently, more attention has been given to traumatic lesions, as these injuries can provide valuable insights into human behaviour, namely data about the nature and frequency of interpersonal aggressions in prehistory (Lambert 2002; Jurmain *et al.*, 2009). However, the commingled and fragmented conditions of Portuguese human bone assemblages makes its study difficult, with crania frequently reduced to small fragments, a total absence of facial bones, and the postcranial skeleton reduced to pieces.

This contribution reviews bone injuries from skeletal collections recovered in Portugal and attributed generically to the Middle and Late Neolithic that could represent cases of interpersonal violence.

The chronological attribution of the human remains discussed here is based on associated funerary objects and on several radiocarbon dates, the latter obtained mostly from single human bones from each burial structure. None of the discussed specimens below has yet been directly dated.

The cases listed below are based on personal observations with the exception of material from Algar do Bom Santo and Cerro das Cabeças, which rely on published sources. The region of Tomar is not discussed here as another chapter deals with its data (see Oosterbeek and Tomé, this volume, Chapter 16).

The traumatic lesions considered in this chapter include cases of cranial injuries (depressed and puncture injuries), projectile injuries, and cut marks. We excluded cases of trepanation in the present study unless they showed clear signs of a previous or associated trauma.

TRAUMA CASES SUGGESTIVE OF INTERPERSONAL VIOLENCE FROM PORTUGUESE LATE NEOLITHIC BURIALS

Skeletal injuries possibly related with acts of violence were observed in 16 Portuguese Late Neolithic burial collections listed below. The site numbers relate to the map legend (Figure 17.1).

Dolmen of Ansião (1)

The Dolmen of Ansião (Leiria) was discovered in the late nineteenth century during construction of the road between the towns of Ansião and Coimbra, in a mountainous area of the Alta Estremadura. The recovered finds (Leisner and Kalb 1998) place the use of this tomb in the second half of the fourth millennium BC, which seems to be confirmed by a single radiocarbon date (Sac-1559, 4640 $\pm$ 90 BP: 3640–3100 cal BC) obtained from a femur fragment (Silva 2002b). (All radiocarbon dates mentioned in the text are presented at two sigma and were calibrated with OxCal 4.0.5 (Bronk Ramsey 2001, 2008), using the calibration curve IntCal04 (Reimer *et al.* 2004).) At the beginning of the twentieth century, these human remains were transferred to what is now the Department of Life Science (previously the Department of Anthropology), University of Coimbra, where

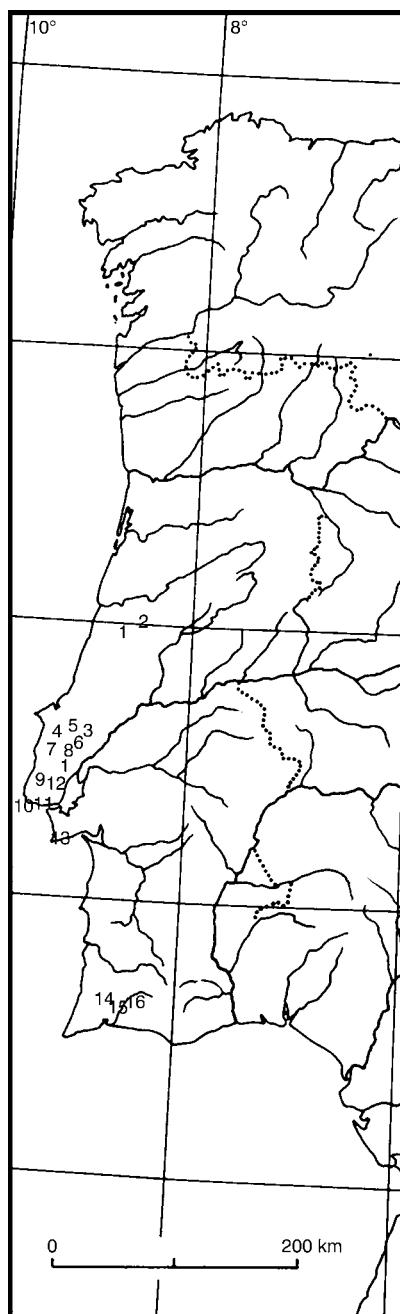


Figure 17.1. Sites referred to in the text. Map adapted from V.S. Gonçalves (1989). 1. Dolmen of Ansião; 2. Covão de Almeida; 3. Lugar do Canto; 4. Serra da Roupã; 5. Fontainhas; 6. Vale Côvo; 7. Cabeço de Arruda II; 8. Algar do Bom Santo; 9. Samarra; 10. Poço Velho; 11. São Pedro do Estoril II; 12. Carcavelos; 13. Lapa do Bugio; 14. Alcalar 9; 15. Monte Canelas I; 16. Cerro das Cabeças.

they are currently housed. From this collective burial a minimum number of individuals (MNI) of 37 has been identified, with 23 adults (both sexes) and 14 subadults (all age groups are represented).

In this sample, only skull injuries on adult individuals of unknown sex were detected. These included two probable projectile injuries and depressed cranial fractures (DCF). Behind the left orbit of a fragment of frontal bone belonging to an adult of unknown sex, a triangular lesion is visible (Figure 17.2). On the lateral side of the bone, a post-mortem fracture led to the loss of some bone, making it impossible to determine the exact dimension of the injury; its estimated maximum exocranial dimension is 30 mm $\times$ 15 mm. On the tip of the lesion, the perforation is complete. This roughly ellipsoid opening measures approximately 5 mm $\times$ 2.5 mm. Signs of healing are visible on the external and internal surfaces, including margins of the hole. In the endocranial view, smooth margins of the defect are even more prominent. Lateral to the hole there is a small and roughly circular bone mass, probably associated with the traumatic event that is fused with the inner table of the frontal bone. There are no signs of infection or other complication around the lesion. This injury seems to be the result of a projectile impact, probably an arrowhead that would have struck the individual from the left and from behind (Silva 2003a).

Six other cranial fragments belonging to adult individuals of unknown sex exhibit DCFs. The locations of these injuries occur on two frontal bones, two above the sagittal suture, one on the right parietal bone and one on the occipital bone. The contours of these cranial depressions are circular or oval, ranging from 10 to 20 mm maximum

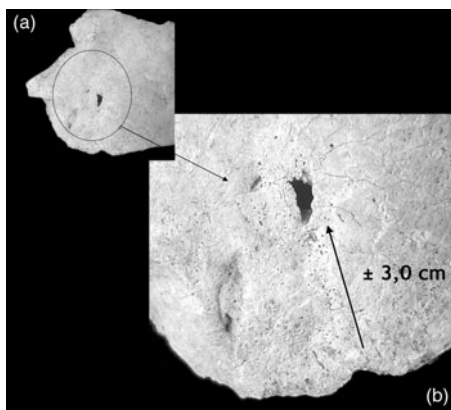


Figure 17.2. (a) Exocranial view of the left side of the frontal bone (DEA. 843) from the dolmen of Ansião showing an injury interpreted as caused by an arrowhead. (b) Details of the lesion.

diameter and a depth of about 1 mm. All are completely healed. The exact prevalence of these lesions is difficult to establish, as we cannot exclude that some fragments could belong to the same individual. Considering the frontal bone, the prevalence of this skull injury for the adult individuals would be 9.5% (two of 21). Moreover, the frontal bone (DEA116) displays another injury besides the DCF. This partial perforation lesion with a minimum anteroposterior length of 10 mm $\times$ 4 mm (the bone is broken post-mortem) is very similar to the projectile injury describe above. Considering all types of injuries presented, at least three adult individuals (14.3%) from this site display cranial injuries.

Covão d'Almeida (Eira Pedrinha) (2)

Covão d'Almeida is one of a group of natural caves used as a funerary space, collectively known as Eira Pedrinha. The recovered finds and a radiocarbon date (Beta-134363, 4480 $\pm$ 60 BP: 3370–2930 cal BC) on human bone place its use during the Late Neolithic (Gama and Cunha 2003). The bones were recovered selectively by the excavators, mainly complete skulls, mandibles, and long bones, and represent an MNI of 144 individuals, including 31 subadults. One male cranium presents an ovoid/elliptical-shaped, healed lesion in the middle portion of the left frontal bone. On its central portion another depression of 18 mm $\times$ 8 mm is visible. On the exocranium, an area of reactive and smooth bone surrounding the central depression is visible. In the endocranium, an osseous callus with a transverse diameter of 27 mm and longitudinal diameter of 1 mm is visible. A subsequent study reinterpreted this lesion as a trepanation, performed after a cranial trauma resulting in a severe depressed fracture (Gama and Cunha 2003).

Lugar do Canto (3)

Lugar do Canto (Alcanede, Santarém) is a natural funerary cave. It was discovered in 1975 and excavated sometime soon after. The finds associated with primary and secondary deposits—the latter probably resulting from the reduction and rearrangement of previous primary deposits—places its use broadly in the Middle and Late Neolithic, between 4200 and 3500 BCE (Leitão *et al.* 1987; Cardoso and Carvalho 2008), consistent with the single radiocarbon

date (Sac-1715, 5120 ± 80 : 4230–3700 cal BC), obtained on bone fragments from the same skeleton (Cardoso and Carvalho 2008).

The human remains were first studied by S. Rolston (cited in Leitão *et al.* 1987) who proposed a maximum number of 48 individuals of both sexes, and adults and subadults of different age groups. The skeletal collection suffered some losses, but a part was kept at the Smithsonian Institute (Washington DC) and another was recently deposited at the Museu Nacional de Arqueologia (Lisbon) by J.L. Cardoso. Both portions of the collection are presently under study by the authors (AMS, RB, and MTF), upon request and return of the collection from abroad. These results should be considered as preliminary. (Recently, more bones from this collection were identified (including cases of cranial trauma) but it was not possible to include them in the present work.)

Two incomplete crania under study in the Department of Life Sciences of the University of Coimbra ($n = 7$) display signs of trauma. The first is a middle-aged individual of unknown sex. On the anterior part of the left parietal bone, near the coronal suture, a healed oval-shaped depression is visible. The maximum length (anteroposterior) is 40 mm, 20 mm wide, and 1 mm deep (Figure 17.3). An old and incomplete crania, probably female, exhibits on its left parietal bone, an oval-shaped depressed fracture that extends 30 mm in maximum length and 15 mm wide.



Figure 17.3. Superior view of adult crania of unknown sex of Lugar do Canto exhibiting a healed, depressed fracture on the left parietal bone.

Serra da Roupa (4)

In 1971, a collective burial place on a small limestone massif near the village of Columbeira was found by three collaborators of the Museu Municipal do Bombarral (Silva 2002b, 2003b). Owing to extensive destruction by erosion, the total original area of the platform is unknown as is the magnitude of the loss of human remains. However, it is assumed that this tomb, Serra da Roupa, could have taken advantage of some sort of rock shelter. The radiocarbon date (Sac-1611, 4560 $\pm$ 110 BP: 3630–2920 cal BC) on human bone places that individual and presumably the others in the second half of the fourth millennium BC. The MNI is 40, 28 adults and 12 subadults, including individuals of both sexes and different age groups (Silva 2003b).

Among the cranial fragments from this burial are two crania exhibiting DCFs, representing about 9.1% of the individuals represented by cranial bones (two of 22).

An adult female skull of middle age from Serra da Roupa displays two circular depressed cranial fractures with diameters of 10 mm and about 1.5 mm depth, both remodelled. One is located on the left parietal bone, 25 mm from the lambda and near the sagittal suture, and the other on the right parietal bone, in a mesial position. The second specimen diagnosed with a cranial vault injury is an adult male skull showing a healed circular depression on the right parietal bone, in a location very similar to the second DCF described for the previous female cranium.

Fontainhas (5)

Fontainhas (Cadaval) is a natural burial cave located in the Montejunto mountains. It was excavated by the Geological Services in the nineteenth century, and the finds are housed at the Museu Geológico (Lisbon). The condition in which the human bones were found is unknown, but they were recovered together with finds that place deposition between the second half of the fourth and first half of the third millennia BC. The radiocarbon date (TO-358, 4170 $\pm$ 60 BP: 2900–2580 cal BC) on a human rib (Jackes *et al.* 1997) seems to partially confirm that assumption. The study of the human bone collection indicated an MNI of 17, but there was no sex and age information (Jackes *et al.* 1997), although a similar pattern can be assumed from other necropoli.

One adult cranium exhibits a small oval depression on the left frontal bone with signs of healing. This depression measures 25 mm in length, 14 mm wide, and a maximum of 1.0 mm in depth. This lesion was first interpreted as a trepanation but now it is considered a cranial trauma (Silva 2003c; Campillo 2007).

Pragança (6)

In the region of Serra de Montejunto, many caves were explored from the late nineteenth century to the 1930s. The materials were later deposited in the Museu Nacional de Arqueologia and Museu Etnológico (both in Lisbon; Gonçalves 1990–1992). Among them, a cranium of a middle-aged male individual is currently housed in the Museu Nacional de Arqueologia, and is labelled as coming from the cave of Furadouro da Alargada (Pragança). It is dated to the Late Neolithic by Gonçalves (1990–1992). However, apparently, the same cranium was described in 1946 by Mac White as being exhumed from ‘Pragança Val Tomate’, a cave dated to the Early Bronze Age. Therefore, the exact provenience and dating of this cranium is not completely clear (Silva 2003c). It shows signs of sharp force trauma in the form of a complete perforation to the right parietal bone along the right coronal suture (Figure 17.4), extending 115 mm to the right of

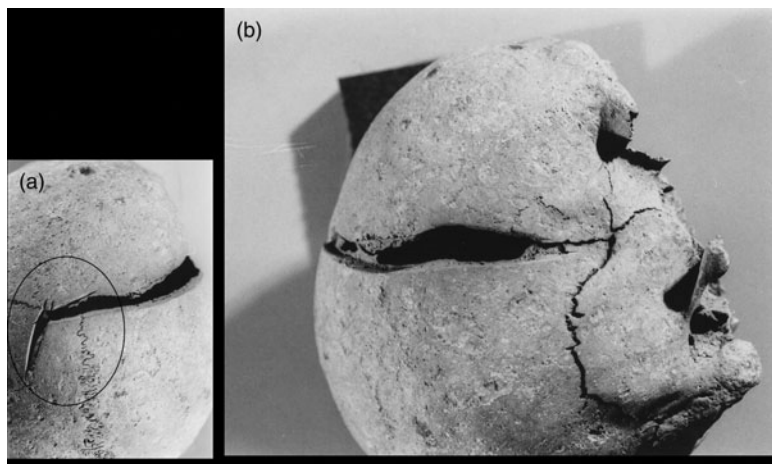


Figure 17.4. Superior (a) and lateral (b) views of the skull from Vale Côvo (Pragança). The incisions performed on the left parietal bone were interpreted as a possible case of trepanation. However, those visible on the right lateral side of the parietal bones represent another trauma.

bregma. The hole is irregularly rectangular, measuring 115 mm mediolaterally and 10 mm anteroposteriorly along the coronal suture, mostly on to the right parietal bone. There are two small areas in this hole that seem to show tenuous signs of healing, as it appears that the compact bone began to cover the diploid tissue. Two more parallel cut marks exist on the anterior part of the left parietal bone, 35 mm long and running approximately parallel to the anterior sagittal suture, and 2 mm in depth upon the outer table, with no visible signs of healing. The interpretation of these cut marks is difficult. One hypothesis could be that incisions on the right parietal bone represent a sharp force trauma and the two parallel incisions represent signs of trepanation, that is, a case where a trepanation was performed after another cranial trauma (Silva 2003c).

Cabeço da Arruda I (7)

Cabeço da Arruda 1 (Torres Vedras) seems to have been a rock-cut tomb, although it was partially destroyed upon discovery in 1933, limiting its identification (Trindade and Ferreira 1956; Silva 2002b). According to the associated finds and the radiocarbon dating obtained on bone remains (Silva 2002b) this tomb was used between the second half of the fourth and the first of the third millennia BCE. The human remains were commingled and fragmented. The study of the skeletal collection indicated an MNI of 19, with both sexes and five subadults (Silva 2002b). Among the adult cranial sample, an ovoid depressed fracture was located on a left parietal bone near the lambda (1 of 14 = 7.1% of the adult individuals). This healed lesion extends to a maximum of 10 mm.

Algar do Bom Santo (8)

Algar do Bom Santo is a natural cave located in the mountain range of Montejunto (Alenquer). It was used as a collective burial place during the Middle and Late Neolithic, according to the finds and radiocarbon dating between 3900 and 2900 cal BC (Duarte 1998). Partial excavations suggest both primary and secondary deposition, the latter due probably to the reduction and rearrangement of skeletal remains, resulting in the commingled condition of the assemblage. Until now, at least 121 individuals are represented (Duarte 1998). A partial study

of palaeopathology conducted by McGarvey (2002) analysed 21 crania. Among this sample, four crania display signs of traumatic lesions.

The first case belongs to one adult cranium, probably male, and presents a depressed fracture on the left parietal boss, 49 mm from the sagittal plane. The surface of the cranium is partially perforated. The fractures measures 20 mm in diameter medial-lateral and 13.9 mm in diameter superior-posterior. The ectocranial margins exhibit an inward bevel and the endocranial aspect being larger. The margins are very sharp and no evidence of sclerosis or bony reaction was observed. This injury was identified as a depressed fracture resulting from a blunt force impact with an oval/triangular-shaped object (McGarvey 2002, p.32).

The second case corresponds to the cranium of a middle-aged individual, probably male, with a semicircular depression on the left parietal bone, 45.5 mm posterior to the coronal and 72.3 mm lateral to the sagittal suture, along the temporal line. This lesion measures 17.2 mm in diameter and seems well-healed (McGarvey 2002, p.33).

An old male adult cranium exhibits three, possibly four (even though in the statistical analysis, only three traumas were considered), peri-mortem lesions of different sizes consistent with DCFs. On the right parietal bone, two small concentric depressed fractures were observed. The first is elliptical, located just above the temporal line, on what is probably the coronal suture, measuring 11.8 mm medio-laterally and 6 mm superoposteriorly. The inner table and diploë seem to be affected. On the posterior part of this bone, 15.5 mm above the lambdoidal suture and 37.2 mm lateral to the sagittal suture a second small concentric fracture is present, measuring 5.3 mm mediolaterally and 7.3 mm superoposteriorly. No signs of infection or healing are evident. Besides these two injuries, a linear fracture, measuring 53.9 mm, radiates from a large fracture on the right lateral aspect of the occipital bone. This fracture, with no signs of healing or infection, is characterized by complete perforation of the occipital, 45.2 mm anteroposterior length and 22.6 mm along its widest margin (McGarvey 2002, p.47).

The last case reported by McGarvey (2002, p.67) is an old adult incomplete cranium where the left temporal and parietal bones share a circular perforation, just adjacent to the parietal-mastoid and occipital-mastoid articular region. Some remodelling is visible around the perforation that extends 9.1 mm at its maximum diameter. Several diagnoses were proposed for these perforations, as

the author did not exclude DCF and trepanation, more probable but others, as osteomyelitis or granuloma. However, this specimen was not directly observed by us.

Samarra (9)

The tomb of *Samarra* (*Sintra*, Lisbon) was discovered in 1948 (França and Ferreira 1958). Although it was not possible to ascertain the type of tomb, as it was destroyed at the time of discovery, it was probably a vaulted chamber tomb because of the amount of stone blocks found mixed with the burial remains. This assumption is also consistent with the finds, which are similar to those frequently found in that type of tomb in the region. These tombs seem to have been built and primarily used between 2900 and 2400 BC. The only existing radio-carbon date (Sac-1827, 3820 ± 60 : 2470–2060 cal BC) obtained on human bone (Silva and Ferreira 2008) indicates at least one later deposition in the second half of the third millennium BC.

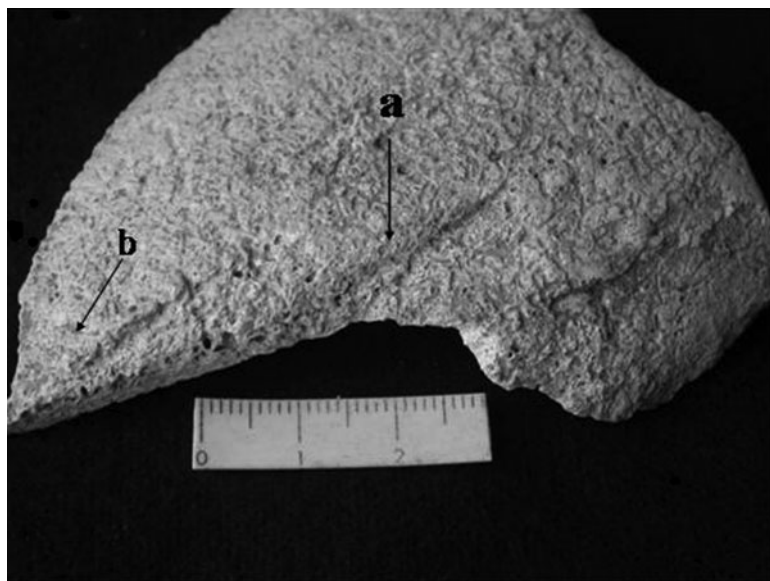


Figure 17.5. Lateral side of a right adult parietal bone exhumed from the collective burial of Samarra (Portugal) with signs of a complete incision. (a) incomplete perforation; (b) thinning of the cranium vault.

The excavation of this collective burial revealed a great number of commingled and fragmentary human remains. Currently, a significant portion of these remains is deposited in the Museu Arqueológico de São Miguel de Odrinhas (Sintra) and corresponds to an MNI of 55 adults of both sexes. Among the crania fragments, a right parietal bone, belonging to an adult of unknown sex, displays signs of four traumatic injuries (Figure 17.5), comprising two DCFs and two incisions (Silva and Ferreira 2008). On the lateral side of the parietal bone fragment, a complete perforation of at least 60 mm in diameter is visible (the bone has a post-mortem fracture). Near the coronal suture, the cutting was incomplete, perforating only the outer table. Macroscopic signs of remodelling are visible along the margin, with smoothing of the margin edges. Furthermore, loss of typical layering of the cranial bone at the defect margins, in particular the loss of the diploid structure, had already begun. At the posterior end of the incision, the parietal bone is very thin, exhibiting almost half of the thickness of the surrounding bone, suggesting a depressed fracture. The left margin of the parietal bone fragment, measuring 80 mm, shows signs of a complete incision. Here, the cutting line is curved, in the direction of the endocranium. At the mid-portion of this incision, resorption of the marginal bone edges had begun and new bone formation is visible. Moreover, partial loss of the diploid structure occurred. On this side of the fragment, the parietal bone near the coronal suture is also very thin. This last alteration was also interpreted as a depressed fracture. The two perforating traumas could be caused by a sharp force cranial injury, although a case of trepanation cannot be excluded as these incisions are very similar to trepanation by the incision method performed on a young adult male from the rock-cut tomb of São Pedro do Estoril II (Silva 1999).

Poço Velho (10)

The natural caves of Poço Velho (Cascais, Lisbon) were discovered in the nineteenth century. These caves seemed to have been used as a collective burial place in the Late Neolithic. Based on the recovered finds and radiocarbon dates, obtained from several human bones, its use seems to have been concentrated between 3400 and 2200 cal BC (Gonçalves 2009). A recent study of human remains proposed an MNI of 115, comprising 93 adults (both sexes) and 22 subadults (Antunes-Ferreira 2005).

Three crania from this sample show DCFs and one incision. This site yields the only trauma observed in a subadult. This is a cranium aged 5 years $\pm$ 16 months showing a circular depressed fracture, 8 mm in diameter, localized in the central part of the frontal bone. The lesion seems remodelled (Antunes-Ferreira 2005, pp.88–89). The second case from this site is an adult female skull with two depressed fractures, one on the right side of the frontal and one on the left parietal. The third case involves the cranium of a male with a circular cranial depression of 9 mm in diameter, on the right parietal. The final case exhibiting cranial vault injury is an adult frontal bone, probably male, exhibiting a 50 mm long incision. Signs of healing are visible (Antunes-Ferreira 2005). This injury is very similar to those from the dolmen of Ansião already mentioned, which could have resulted from a projectile impact.

Considering the cranial adult sample from this site (MNI = 63 adults) the prevalence of cranial injuries in this sample is about 4.8% (three of 63).

São Pedro do Estoril II (11)

The rock-cut cave of São Pedro do Estoril II (Cascais) was excavated in 1944. Human remains were found commingled and fragmentary, although some anatomical connections were identified during fieldwork (Leisner *et al.* 1964). However, these were lost after the fieldwork. At least an MNI of 54 was present, with 41 adults and 12 subadults (Silva 1999). Among the individuals represented by cranial remains, one cranium from a middle-age male (about 3.5%; one of 28), displays a healed circular depression on the left side of the frontal bone, with a diameter of 10 mm (Figure 17.6).

Dolmen of Carcavelos (12)

The dolmen of Carcavelos is a Late Neolithic tomb located near Lisbon. It was first excavated during the early 1990s and more recently in 2005–2006 (Boaventura and Estevão in press). During this latter and partial excavation, human remains were commingled with no clear anatomical connections detected. Two radiocarbon dates from human skeletal material placed the main use of this site between 3000 and 2600 cal BC, although early and later uses were detected (Hillier *et al.* 2009; Boaventura and Estevão in press). To

Figure 17.6. Healed depressed skull fracture on the left frontal bone of middle-aged adult male from SPE II.



date only the adult remains from Carcavelos have been studied, with an MNI of 80, of both sexes (Hillier *et al.* 2009). Preliminary analysis of the skeletal remains from the site revealed the presence of cut marks on a cranium and two humeri (Hillier *et al.* 2009).

A partial cranium consisting of right and left partial parietals and occipital bone presents 27 cut marks, restricted to two clusters: the first cluster is near the sagittal suture at obelion and the second near the posterior portion of the temporal line on the right parietal. The cut marks range in length from 2.37 mm to 11.4 mm (Figure 17.7).

Among the postcranial bones, a partial left distal humerus exhibits cut marks on the posterior surface immediately superior to the lateral and medial supracondylar crests (Figure 17.8). Only four (located

Figure 17.7. Cranium with cut marks from the dolmen of Carcavelos. Photo of J.P. Ruas, IGESPAR (in Hillier *et al.* 2009).

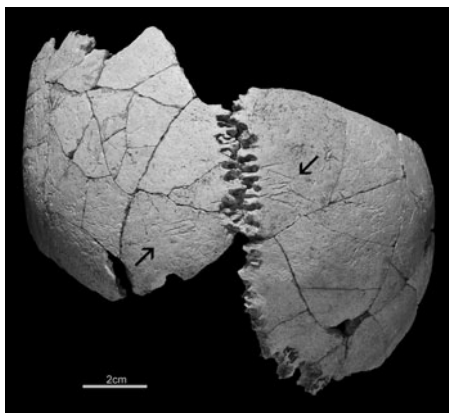
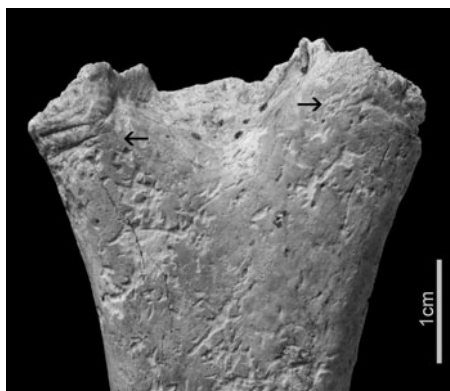


Figure 17.8. Humerus with cut marks from the dolmen of Carcavelos. Photo of J.P. Ruas, IGESPAR (in Hillier *et al.* 2009).



medially) were measurable and these range in length from 5 mm to 8.9 mm. They are horizontally oriented with a slight inclination distally toward the midline of the bone. The angle of force of the cuts appears to be inferior, rather than perpendicular. In addition to these, minute cut marks are located upon the edge of the olecranon fossa. These cut marks could be compatible with a defensive position of the arms.

A second specimen, a right distal adult humerus displays possible cut marks on the posterior surface, with one located laterally and four located medially, ranging in length from 4.6 mm to 7.8 mm. They are located near or in areas of soft tissue attachments and resemble the pattern observed in archaeological human and faunal remains associated with removal of soft tissue and disarticulation.

Although body preparation (disarticulation and defleshing) for secondary burial seems to be one possible explanation, due to the absence of other signs of trauma, others cannot be excluded.

Lapa do Bugio (13)

Lapa do Bugio is a small natural cave, 9 m × 5.5 m, located in a limestone cliff overlooking the sea at Azóia, Sesimbra, about 40 km south of Lisbon. The cave was discovered in 1957 by R. Monteiro (Monteiro and Serrão 1959). Several archaeological excavations took place between the late 1950s and the 1960s. The human remains are deposited in two museums: Museu Municipal de Sesimbra (MMS) and Museu de História Natural of the University of Oporto.

The known finds indicate the cave's funerary use between the middle of the fourth and the second half of the third millennia. The two radiocarbon dates (GrN-5628, 4850 ± 45 BP: 3750–3520 cal BC; OxA-5507, 4420 ± 110 BP: 3500–2870 cal BC), obtained respectively from unidentified charcoal fragments and from the shaft of a hairpin seem to partially verify this time span (Monteiro *et al.* 1971; Cardoso *et al.* 1992).

The human remains housed in the MMS were recently re-analysed by two of the authors (AMS and RM). They represent an MNI of 16: 15 adults and one subadult, based on the mandibles. Among the three vertebral remains, an arrowhead was found embedded in the second cervical vertebra of an adult of unknown sex. As can be seen in Figure 17.9, the tip enters into the vertebral body. The other end of the arrowhead is leaning against the spinous process indicating that this projectile entered from behind. The radiograph and computed tomography images of this vertebra confirm the entrance of the arrowhead tip into the vertebral body. As expected, no signs of remodelling are visible (Silva and Marques 2010). According to the first report published (Monteiro and Serrão 1959), this vertebra was found on the surface of the cave.



Figure 17.9. Inferior view of adult axis with an embedded arrowhead recovered from Lapa do Bugio (Sesimbra).

Alcalar 9 (14)

Alcalar 9 is a vaulted-chamber tomb, excavated by A. Santos Rocha in 1900. A remaining section of the corridor was excavated in 2004, together with a niche discovered inside the chamber. In the corridor, a secondary deposit was found inside two overlapping bowls, corresponding to an adult male. The human remains recovered in the later work correspond to an MNI of six, comprising three adults and three subadults. On the right side of the frontal bone of an adult male a circular depression is visible, measuring 15 mm × 17 mm and about 1 mm depth. It seems to correspond to a well-healed old trauma (Ferreira and Silva 2008).

Monte Canelas I (15)

The rock-cut tomb of Monte Canelas I (Alcalar, Algarve) was excavated between 1991 and 1994, producing more than 6000 fragments of human bone corresponding to an MNI of 171 (Silva 1996a,b). The majority of the bones were found commingled and dispersed in this collective tomb but it was possible to identify five primary inhumations, in a fetal position, and 30 anatomical connections. The associated finds and radiocarbon dating place the tomb's main use between the second half of the fourth and first centuries of the third millennia BC (Parreira and Serpa 1995; Silva 1996a). Depressed fractures were observed on two incomplete crania (of 97/2%). The first case belongs to the cranium of one of the primary inhumations, a middle-aged male. On the right side of the frontal, a remodelled circular depression is visible, 10 mm in diameter. The second case corresponds to a young adult cranium of unknown sex, recovered from the commingled sample and exhibits an oval depression on the right parietal. Despite some visible healing of this injury, there are still signs of infection around the depression.

Cerro das Cabeças (16)

In 1993 during construction of a parking lot located on a hill, about 1 km northeast from Silves (Algarve), a pit burial with two inhumations was found and attributed to the Late Neolithic (Gomes and Paulo 2003). However, the type of burial and associated artefacts make it more plausible to ascribe it to the Middle/Late Neolithic

transition. The better-preserved inhumation belongs to a young adult male, deposited in a fetal position. Among the recovered human bones, one rib fragment shows a rectilinear cut and the diaphyses of two long bones display fine parallel cuts. These cut marks were initially considered as post-mortem and interpreted as part of an unknown ritual behaviour (Gomes and Paulo 2003, p.94). The incompleteness of this skeleton and the impossibility to observe it prevents us from giving an opinion about these cut marks.

SKELETAL INJURIES IN PORTUGUESE LATE NEOLITHIC SAMPLES: ACCIDENTS OR INTERPERSONAL VIOLENCE?

This survey of skeletal injuries in the Portuguese Late Neolithic reported 43 traumatic lesions (37 cranial and six postcranial; Table 17.1) from 16 sites representing a minimum number of 620 adult individuals, although not all of them are represented by all skeletal elements. In addition, this account has to take into perspective the total number of Neolithic individuals studied until now and mentioned above.

These injuries were scored on a minimum of 28 individuals (one subadult and 27 adults), including individuals of both sexes. These

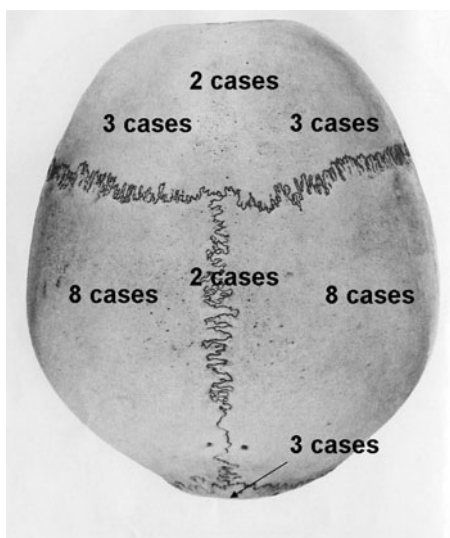


Figure 17.10. Distribution of the depressed fractures in adult individuals by crania element.

Table 17.1. Skeletal injuries that may represent cases of interpersonal violence found in Portuguese Late Neolithic skeletal populations

Site	Demographic data	Type of injury	Locations	State
1: Dólmen de Ansião	Adult, unknown sex	Projectile	Behind left orbit	Remodelled
1: Dólmen de Ansião	Adult, unknown sex	DCF	Frontal bone	Remodelled
1: Dólmen de Ansião	Adult, unknown sex	DCF and projectile	Frontal bone	Remodelled
1: Dólmen de Ansião	Adult unknown sex	DCF	Middle part of sagittal suture	Remodelled
1: Dólmen de Ansião	Adult, unknown sex	DCF	Middle part of sagittal suture	Remodelled
1: Dólmen de Ansião	Adult, unknown sex	DCF	Right parietal bone	Remodelled
1: Dólmen de Ansião	Adult, unknown sex	DCF	Occipital bone	Remodelled
2: Covão de Almeida	Middle age male	DCF	Left frontal bone	Remodelled
3: Lugar do Canto	Middle age adult, unknown sex	DCF	Left parietal bone	Remodelled
3: Lugar do Canto	Old female	DCF	Left parietal bone	Remodelled
4: Serra da Roupá	Middle age female	2 DCF	Left parietal bone; Right parietal bone	Remodelled
4: Serra da Roupá	Adult male	DCF	Right parietal bone	Remodelled
5: Fontainhas	Adult, unknown sex	DCF	Left frontal bone	Remodelled
6: Pragança	Middle age male	Perforation, Incisions	Right parietal bone; Anterior part of left parietal bone	Remodelled; No remodelling
7: Cabeço da Arruda I	Adult, unknown sex	DCF	Left parietal bone, near lambda	Remodelled
8: Algar do Bom Santo	Adult, probably male	DCF	Left parietal boss	Signs of healing
8: Algar do Bom Santo	Middle age, probably male	DCF	Left parietal bone	Remodelled
8: Algar do Bom Santo	Old adult, probably male	DCF 2 Linear fracture	Right parietal bone; Right parietal bone; Right occipital bone	No signs of remodelling
8: Algar do Bom Santo	Old adult, unknown sex	DCF (?)	Left parietal and temporal bone	Signs of remodelling
9: Samarra	Adult	2 DCF, 2 Incisions	Right parietal bone	Remodelled
10: Poço Velho	Adult female	2 DCF	Right frontal bone; Left parietal bone	Remodelled
10: Poço Velho	Adult male	DCF	Right parietal bone	Remodelled
10: Poço Velho	Adult male (?)	Projectile (?)	Frontal bone	Remodelled
10: Poço Velho	Subadult	DCF	Middle part of frontal bone	Remodelled
11: São Pedro do Estoril II	Adult male	DCF	Left side of frontal bone	Remodelled
12: Dolmen de Carcavelos	Adult, unknown sex	Cut marks (two clusters)	Near sagittal suture; Right parietal bone	–
12: Dolmen de Carcavelos	Adult of unknown sex	Cut marks	Left distal humerus	–
12: Dolmen de Carcavelos	Adult, unknown sex	Cut marks	Right distal humerus	–
13: Lapa do Bugio	Adult, unknown sex	Projectile	Axis	No remodelling
14: Alcalar 9	Adult male	DCF	Right side of frontal bone	Remodelled
15: Monte Canelas I	Middle age male	DCF	Right frontal bone	Remodelled
15: Monte Canelas I	Young adult, unknown sex	DCF	Right parietal bone	Remodelled
16: Cerro das Cabeças	Young adult male	Cut marks	Rib fragments; two diaphysis of long bones	–

data suggest that cranial injuries were much more frequent than postcranial injuries. Modern population data show that high cranial trauma is related to interpersonal violence, whereas postcranial injuries are much more often associated with occupation or activity (Walker 2001). Thus, the observed pattern may be suggestive of some interpersonal violence, which is not unexpected as some degree of violence was always present in human history (Monks 1994; Guilaine and Zammit 2001).

The cranial injuries include: 29 DCFs (including the subadult), one linear fracture, three projectile lesions probably due to arrowheads, three puncture injuries and one case of several minute cut marks (Figure 17.10; Table 17.1).

The DCF were circular (17 of 29 = 58.6%) to ovoid (12 of 29 = 41.4%) in shape, measuring between 5.3 mm and 45 mm, and about 1 mm in depth. The mean diameter of these lesions is 14.1 mm (including the subadult from Poço Velho).

In the adult sample, 10 DCFs were observed in male individuals, five in females, and 13 on crania of indeterminate sex. These results suggest a male preponderance, as seen in the modern pattern of violence, in which males tend to suffer more from all types of traumatic lesion throughout their lives (Walker 2001; Judd 2004). The average diameter of DCF is slightly larger in males (mean = 14.71 mm) than in females (mean = 13.46 mm) but this is not statistically significant (Mann-Whitney $U = 21.5$; $P = 0.658$; for the statistical analysis, maximum diameter was considered.) Twelve DCFs were scored on the left side of the cranium, 12 on the right side, and the remainder on the middle part of the cranium. The size of the DCF on the left side (mean = 17.2 mm) of the cranium are larger than on the right side (mean = 11.3 mm), but again this is insignificant (Mann-Whitney $U = 45.5$; $P = 0.116$). The parietal ($n = 19$; 67.9%) was the most affected skull element followed by the frontal ($n = 8$; 28.6%) and occipital bones ($n = 1$; 3.6%). Among the DCFs, all injuries show signs of healing with the exception of the three or four lesions detected on the old male cranium of Algar do Bom Santo.

Projectile injuries were identified on the frontal bone of one adult male and of two individuals of unknown sex (Poço Velho and Dólmen de Ansião), and an arrowhead was found embedded in a second cervical vertebra from Lapa do Bugio. All the projectile injuries were inflicted from behind suggesting that the victim was fleeing or 'caught by surprise' by the attacker. However, all the cranial

lesions show signs of healing. The other postcranial injuries includes cut marks on two humeri from the Carcavelos dolmen, and cut marks on a rib and two long bone shafts of a individual exhumed from Cerro das Cabeças, which could be related to body preparation.

Multiple traumas were found on five adult individuals (two males, one female, and two individuals of unknown sex). These include an adult frontal bone from the dolmen of Ansião (DCF and possible projectile injury), a middle-aged female crania from Serra da Roupá (two DCFs), an elderly male cranium from Algar do Bom Santo (three or possibly four DFCs), one right parietal bone from Samarra exhibiting evidence of four traumas (two DCFs and two complete penetrating injuries), and one individual from Cerro das Cabeças with cut marks on a rib and two long bone shafts.

Are these injuries the result of accidents or do they represent signs of interpersonal violence? For the projectile injuries (dolmens of Ansião, Poço Velho, and Lapa do Bugio) or those cases where evidence of some type of weaponry is likely (Pragança, Algar do Bom Santo, and Samarra) the hypothesis of interpersonal violence is more plausible.

The presence of DCFs may not be a clear sign of violence. These injuries either may have been caused by an intentional blow with a blunt object or have resulted from an accident, as according to modern medical literature, depressed fractures are caused by road traffic, industrial or domestic accidents, assault, and sports (Braakman, 1972). Also relevant are the ethnographic and comparative clinical data. As noted by Judd (1970), stoning is a form of belligerence observed in past populations as it represents an individual spontaneous act with intent to injure or to defend oneself. Moreover, the usual target in stoning is the head, due its close association with the identity of the individual, to its vulnerability, and to produce maximum damage (Judd 1970; Knüsel 2005).

FINAL REMARKS

This work attempted to summarize traumatic lesions present on skeletal remains from Late Neolithic Portugal that could be related to interpersonal violence. For most of the described lesions, it is impossible to reject the hypothesis of accidental trauma. Moreover,

the collective burial practices of these prehistoric populations, associated with poor preservation and incompleteness of the humans remains, recovered mostly without any anatomical connection, makes it difficult to detect and interpret lesions, including traumatic lesions due to interpersonal violence. Therefore, it is difficult to have a perspective on interpersonal violence concerning those populations.

DCF was the most frequent skeletal trauma found and we cannot exclude that these blunt force injuries were caused by accidents. However, if we assume these possible injuries as signs of interpersonal violence, and we cross it with chronological data from the same burials, it seems possible to verify slight trends.

It is among burials dated to the early and second half of the fourth millennium BC that we find most of these cases. Although we do not yet have direct dating for any of these specimens, the absence of certain artefacts or later dates in some of the burials allows us to make this case. The settlements for this period are difficult to detect. The few known sites seem to indicate communities not completely settled, probably due to their economic activities, namely herding. Individuals that were more mobile and living in less protected settlements were more likely subjected to raids and ambushes.

Meanwhile, during the last centuries of the fourth and first half of the third millennium BC, when several settlements present walls and ditches probably for defence, cases of possible acts of violence have been less frequently detected. The evidence of these walled sites may testify to a higher degree of stable settlements with activities developed closer to home, which would dissuade raids and unexpected ambushes. In some ways, this was a period of deterrence.

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